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91-105

91-105-01- TJN97..

GEOGRAPHIC VARIATION IN HOSPITAL NONLABOR INPUT PRICES AND EXPENDITURES

Final Report

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February 1993

In cooperation with

Boston University

Center for
Health Economics Research

Urban Institute

This research was prepared with the support of HCFA Office of Research under HCFA Cooperative Agreement No. 99-C-98526/1-08 to the Health Policy Research Consortium – Boston University, Brandeis University, Center for Health Economics Research, and Urban Institute. Administrative offices are located at the Heller School, Brandeis University, Waltham, MA 02154. The total cost of this project was $78,974.29 all of which was Federal support. The views and opinions expressed in the report are those of the authors and do not necessarily reflect the opinions of HCFA.

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

Medicare's Prospective Payment System (PPS) reimburses hospitals for providing inpatient services to Medicare beneficiaries. Payment is based on labor and nonlabor standardized amounts, which are adjusted for various factors expected to affect hospital costs. The labor-related standardized amount is adjusted for geographic variation in hospital labor costs by the PPS area wage index. However, no geographic adjustment is made to the nonlabor standardized amount, except for a cost-of-living factor for Alaska and Hawaii.

PPS is designed to compensate hospitals for cost differences that are beyond their control. If there are geographic differences in nonlabor input prices, then a geographic adjustment to the nonlabor standardized amount may be appropriate. Congress, through the Omnibus Budget Reconciliation Act of 1990 (OBRA 90, Section 4002(e)(2), mandated that the Secretary of Health and Human Services collect data on geographic variation in hospital nonlabor input prices, and study the extent to which geographic differences in hospital nonlabor costs are attributable to input price differences. This report responds to the Congressional mandate by evaluating the desirability and feasibility of a geographic adjustment to the PPS nonlabor standardized amounts.

Collection of primary data on hospital nonlabor input prices would be very difficult and expensive. Defining a hospital nonlabor input market basket with corresponding cost shares from the thousands of nonlabor inputs used by hospitals is one serious challenge, especially considering the many product variants hospitals purchase. Obtaining valid prices of inputs from a sufficiently large sample of hospitals is another major challenge, because hospitals are not likely to record the data necessary to compute prices in an accurate and readily accessible format. Adjusting for volume discounts and updating for rapid product change over time are further problems. It may be very difficult to define meaningful prices for such residual PPS market basket categories as "business services" or "all other labor intensive". Collecting nonlabor input prices would impose a large administrative burden on hospitals and on HCFA. Moreover, there is reason to believe that many nonlabor input prices do not vary significantly by area. Given the difficulty and expense of collecting nonlabor input prices, and their potential lack of geographic variation, we analyzed several other possible approaches to a nonlabor adjustment for this report:

- Secondary data on nonlabor input prices;
- Using proxy variables such as the PPS wage index to measure variation in nonlabor prices and costs; and
- Data on hospital nonlabor expense per discharge.

We also discuss the difficulties in primary data collection of nonlabor prices and, given our analysis of secondary input price data, reassess the need for primary data collection. In the remainder of this executive summary, we first review previous research on a PPS nonlabor adjustment, then summarize our findings, and finally draw some conclusions about a PPS geographic nonlabor cost adjustment.

2.0 PREVIOUS RESEARCH ON NONLABOR INPUT PRICES

Two previous studies have addressed geographic variation in nonlabor input prices. The Center for Health Economics Research (CHER), as part of a HCFA grant, examined the feasibility of a PPS nonlabor adjustment (Hendricks, Cromwell, and Pope, 1986). Area data on energy prices indicated substantial regional variations in energy costs. Nevertheless, the small weight of energy costs in the hospital market basket implied that these price variations had only a minor effect on overall hospital costs. Available information on pharmaceutical prices indicated little geographic price variation. Overall, the conclusion of the CHER report was that adequate data were not available to support a PPS adjustment for nonlabor costs. The results of this study were incorporated into a HCFA report to Congress (U.S. Department of Health and Human Services, 1987.)

The Prospective Payment Assessment Commission (ProPAC, 1989) undertook an investigation of geographic price variation. ProPAC gathered prices of nonlabor inputs, critiqued the quality of the data it collected, assessed whether the data it collected was sufficient to construct a nonlabor price index, and considered proxy measures for input prices. ProPAC also performed a qualitative analysis on the existence of a national market for nonlabor inputs by noting hospitals' affiliations with buying groups.

ProPAC was not to able find comprehensive price data by geographic region. In fact, ProPAC was only able to find usable data on four of the nonlabor components: energy, food, malpractice insurance, and telephone. ProPAC noted the sparseness of price data by geographic area and presented the following findings. First, available data on four of the nonlabor components of the market basket indicated area price variation. The amount of variation depended, in part, on the level to which prices were aggregated. ProPAC found that prices varied more at the state level than at the four-census region level, and in some instances, intrastate price variation exceeded interstate price variation.

ProPAC's second finding was that the available evidence suggested that nonlabor input prices did not necessarily move in the same direction. That is, while a given area's energy prices might be higher than another area's, its food prices might be lower. ProPAC also noted that the growth of national markets diminishes the significance of local price variation, and that many, if not most hospitals, either are members of a hospital system (chain) and/or participate in a purchasing group (such as an "alliance"), thus obtaining lower prices than they would purchasing individually. ProPAC interpreted this evidence as suggesting, at a minimum, that hospitals had many available means by which "to obtain prices close to the national average." This, in turn, implied a national market for some nonlabor inputs.

From its findings, ProPAC concluded that available data was insufficient to determine the amount of nonlabor price variation by geographic area. It also concluded that if primary price data were collected, then it would be feasible to geographically adjust for nonlabor prices. Unless that were done, ProPAC stated that use of a proxy measure, such as the PPS wage index, was not advisable.

The current study differs from the ProPAC study in that it: (1) analyzes more recent and additional sources of nonlabor input prices; (2) performs analyses of nonlabor input prices not performed by ProPAC; and (3) analyzes geographic variation in hospital nonlabor expenditures.

3.0 SUMMARY OF FINDINGS

Two major lines of analysis were pursued: nonlabor input prices and hospital nonlabor expenditures per discharge.

3.1 Nonlabor Input Prices

The major conclusions from our analysis of nonlabor input prices are as follows:

(1) Conversations with analysts at hospital purchasing alliances, trade journals, market research firms, and other organizations indicated that many hospital supply prices may be essentially uniform nationwide. To the extent they do vary, prices may be higher in rural areas because of greater transportation costs, and may be lower for larger hospitals because of volume purchasing discounts. However, some nonlabor inputs, such as food, are often bought in more local markets and may exhibit more regional price variation.

(2) Aside from IMS's America Hospital Supply Index and Pharmaceutical database, secondary data was identified on geographic differences in nonlabor input price for only four inputs: food, energy, malpractice insurance, and telephone services. These inputs account for about 30 percent of the nonlabor portion of the PPS market basket (exclusive of capital) and about 8 percent of the entire market basket (exclusive of capital).

All these sources of nonlabor input prices are proxy data; that is, they do not represent what hospitals actually pay, but should represent the relative input prices hospitals face. The data sources vary significantly in quality, geographic coverage and aggregation, and in what they measure. Available secondary data on nonlabor input prices are not suitable in their current form for use in the PPS. Nevertheless, the secondary data are useful for research purposes, that is, as an indication of the likely input price variation that hospitals face.

(3) The IMS America Hospital Supply Index is the only direct source of information on hospital supply prices we could locate. IMS microfilms the supply invoices of about 350 hospitals, stratified by size and the nine Census Divisions, on a continuing basis and classifies expenditure and quantity information by a large number of categories. However, the IMS database has several potentially serious drawbacks. The sample of hospitals is relatively small and nonrandom. Prices calculated from the IMS data do not fully reflect manufacturer discounts to hospitals. Most seriously, it is not clear that IMS can calculate accurate unit prices of homogenous product categories from their data. Example "price" reports they provided were not suitable for determining geographic price variation. The IMS data is oriented toward providing expenditure and market share data for use in marketing and sales. IMS maintains a companion database of pharmaceutical prices, which has similar strengths and weaknesses. In its 1989 Report to Congress, ProPAC also concluded that the IMS database is "probably not appropriate for developing a price proxy".

Because the expense and time required for a complete evaluation of the IMS data would be significant, we did not purchase IMS data in the course of this project. The IMS databases could be studied further, but we are skeptical of their ultimate value. IMS uses a numerical coding scheme to classify hospital supply purchases. The most detailed product categories are identified by 5-digit codes. There are more than 1000 5-digit codes. In 1992, IMS charged $500 to provide unit prices for a 5-digit product category in each of the 9 Census Divisions. IMS representatives stated that purchasing unit price data for all 5-digit product categories would cost approximately $800,000. However, IMS gives a 50 percent discount for prices more than two quarters old. Purchasing regional prices for a sample of 100 products at the discounted price would therefore cost about $25,000. This size sample may be sufficient to determine the usefulness of the IMS Hospital Supply Index. However, obtaining prices by metropolitan/nonmetropolitan, bedsize class, etc. would cost extra. Obtaining drug prices from the pharamaceutical database would also incur a similar cost.

(4) Analysis of available secondary data on prices of food, energy, malpractice insurance premiums, and telephone services revealed the following:

- There is considerable geographic variation in these nonlabor prices. However, each of these inputs has a small share in total hospital costs, and the prices of the four inputs are not highly correlated with each other. Thus, an index of these four prices weighted by their shares of the PPS market basket shows little variation across states. The index varies only from 0.993 to 1.002 among the middle quartile of states, with 1.0 representing the national average. The highest-priced state has an index value of 1.015 and the lowest-priced state a value of 0.982.
- The PPS area hospital wage index is not a good predictor of available input prices. *

3.2 Hospital Nonlabor Expenditures Per Discharge

We attempted to measure hospital nonlabor expenditures using both the 1989 Medicare Cost Reports (MCR) and the American Hospital Association (AHA) Annual Survey. Neither data source was ideal for this purpose. Both MCR and AHA nonlabor cost shares are substantially higher than in the PPS market basket. Moreover, although highly correlated, the MCR and AHA measures of nonlabor expenditures per discharge that we derived were quite different for many individual hospitals and classes of hospitals. The mean MCR nonlabor expenditure was about 30 percent greater than the mean AHA nonlabor expenditure. We conclude that:

- Accurate measurement of hospital nonlabor expenditures would require modifications to the Medicare Cost Report.
- Medicare Cost Report and American Hospital Association data do not provide a consistent measurement of hospital nonlabor expenditure per discharge.

Our descriptive analysis of MCR and AHA hospital total and Medicare nonlabor expenditure per discharge showed the following:

- Nonlabor expenditure per discharge varies considerably geographically and by hospital characteristic;

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* The PPS area wage index used in this report was based on HCFA's 1988 survey of hospital wages (Federal Register 55:171, September 4, 1990). Since October 1, 1993, the PPS area wage index has been based on data from MCR Worksheet S-3 Part II. Although the old and new indices are not identical, they are highly correlated (R^2=.985), so this report's conclusion that the wage index is not a good predictor of input prices would not be expected to change if the new PPS area wage index were used.

- Much of the nonlabor expenditure variation appears to be due to differences in input quantities rather than input prices. That is, much of the geographic variation in expenditures may be the result of differences in the quantity (intensity) of care, not input prices;
- Deflating nonlabor expenditures by the Medicare casemix index or the PPS area wage index does not greatly reduce variation.

The following conclusions were reached from our multivariate analysis of nonlabor expenditure per discharge:

- Hospital casemix, major teaching status, and urbanicity are the factors most strongly associated with higher nonlabor expenditure per discharge. Because these factors are related to intensity of care more than to expected input price differences, variation in expenditure per discharge appears to be dominated by input quantity differences more than by input price differences;
- There is significant regional and urban-rural variation in nonlabor expenditure per discharge, even after controlling for other factors;
- An index of the four nonlabor prices that we were able to measure -- food, energy, telephone, and malpractice insurance -- explained little of the total geographic differences in hospital nonlabor expenditures, once payment adjustors already used in PPS were held constant in a regression model.
- Holding other policy variables constant, the PPS area wage index is correlated with nonlabor expenditure per discharge. However, the incremental power of the wage index to explain nonlabor expenditure per discharge is relatively small. Even after controlling for the PPS wage index, systematic variation in nonlabor expenditure per discharge remains.

The correlation of the PPS area wage index with nonlabor expenditures might form the basis of a PPS adjustment. However, its lack of explanatory power and the remaining systematic variation argue against such an adjustment. Also, the wage index may be correlated with variations in input quantities rather than prices, and it does not predict available nonlabor input prices well.

4.0 CONCLUSIONS

We conclude that a geographic adjustment to PPS nonlabor payments cannot be developed at this time from either available secondary sources of nonlabor input prices or from data on hospital nonlabor expenditures per discharge. Available data on nonlabor input prices indicate that a nonlabor index would probably have little impact on PPS payments. Moreover, an index of available nonlabor prices does not explain much variation in hospital nonlabor expenditures, holding the effects of other PPS payment adjustors constant. Thus, the current lack of a nonlabor adjustment does not appear to impose serious inequities on certain areas or groups of hospitals.

The prices of food, energy, telephone, and malpractice insurance are among the most likely nonlabor input prices to vary geographically. An index of these four prices, weighted by their combined PPS market basket share, varies only from 1.8 percent below the national average to 1.5 percent above it across states. For the half of the states with prices closest to the national average, the variation is only from 0.7 percent below the national average to 0.2 percent above it. This lack of variation is mostly due to the small market basket shares of these inputs and the limited correlation of their prices, not to lack of variation in the individual prices. If all intra-state price variation could be measured, geographic variation in a nonlabor index might be greater.

We were unable to locate geographic prices for other nonlabor inputs. However, a priori expectations and anecdotal evidence suggests that the prices of pharmaceuticals, supplies (photo supplies, rubber and plastics, paper products, apparel, miscellaneous equipment), chemicals, medical instruments, and machines and equipment do not vary much geographically. Most hospitals can purchase these products in national markets through buying groups. However, the degree of nonlabor input price variation across areas cannot be definitively established without collection of data from hospitals. It is not clear from available evidence that a primary data collection effort (estimated to cost at least 2.8 million dollars) would be a good investment. There are severe technical difficulties in collecting accurate prices for the many thousands of hospital nonlabor inputs, each with a small market basket share. Data collected from hospitals could suffer from substantial measurement error. Thus, it might be impossible to construct a more equitable index than the current policy of no adjustment. Difficult issues of how to adjust for volume discounts and how to define prices for certain input categories would have to be resolved. The available evidence indicates that a nonlabor adjustment would have little impact on payments and an expensive and burdensome data collection effort might be difficult to justify.

1.0 INTRODUCTION

Medicare's Prospective Payment System (PPS) reimburses hospitals for providing inpatient services to Medicare beneficiaries. The basic payment consists of pre-determined standardized labor and nonlabor payments which are adjusted by the expected use of resources. The primary adjustment to the PPS payment for the expected resource use is the Diagnostic Related Group (DRG) patient classification system. The design of PPS also includes mechanisms for attaining specific public policy goals and mechanisms intended to ensure equity across hospitals. Payment adjustments for indirect medical education costs, for instance, can be justified in order to properly compensate hospitals for educating physicians. Among the equity features are geographic payment adjustments for wage rate differences to ensure that hospitals are neither over- nor under-compensated for labor they employ. Currently there is no geographic payment adjustment for nonlabor inputs employed by hospitals. The purpose of this study, then, is to: (1) determine whether adequate price data are currently available to adjust nonlabor payments, (2) evaluate the desirability and feasibility of collecting price data, (3) determine the adequacy of proxy nonlabor price measures such as the PPS wage index, and (4) present and analyze the geographic variation in hospital nonlabor expenditures.

The rest of this chapter discusses: (1) the rationale and mechanism used to provide geographic PPS payment adjustments, (2) the components of the PPS market basket, and (3) a review of a Prospective Payment Assessment Commission (ProPAC) report on nonlabor payment adjustments.

1.1 Geographic Payment Adjustments in the PPS

PPS is designed to adjust hospital payments for cost differences that are beyond hospitals' control. Geographic differences in market wage rates are one factor beyond hospitals' control. Although individual hospitals may pay more than necessary to attract workers with specific attributes (e.g., specific formal training), hospitals typically cannot pay less than the market rate for a given class of workers. Thus hospitals in New York City will have to pay a higher salary for an accountant than a hospital in Denver. Failure to adjust for market wage rates that are beyond the control of individual hospitals will result in hospitals in high wage areas being implicitly penalized. Conversely, failure to adjust for local wage rates will result in windfall financial rewards to hospitals in low wage areas.

PPS currently adjusts the labor-related portion of standardized labor amount by the PPS wage index. The current PPS wage index is based on data from a survey HCFA conducted on hospital payroll and hours worked in 1988. The wage index is defined for geographically demarcated markets: MSAs for urban markets and state rural areas for rural markets.

Unlike labor, the standardized nonlabor amount is not adjusted by a geographic nonlabor input price index.[1] The current system, thus, implicitly assumes that the market for nonlabor inputs is national in scope rather than local. If, however, there are geographic differences in nonlabor input prices, then a geographic adjustment for the nonlabor standardized amount may be appropriate. Differences in quantities of nonlabor inputs could also justify a payment adjustment. For example, hospitals located in areas with colder climates such as Alaska might use more energy inputs. Adjustment for quantities, however, should only be for non-discretionary usage of inputs.

1.2 PPS Market Basket: Labor and Nonlabor Components

The importance of a payment adjustment for nonlabor inputs partly depends on whether nonlabor's share of PPS payments is significant. For instance, if nonlabor inputs only accounted for one percent of all hospital costs, then the cost of creating a payment adjustment index may easily exceed the total value of the redistributed payments. PPS's hospital market basket (excluding capital) indicates that the nonlabor share of hospital costs is about 29 percent. Thus the potential for redistribution from a nonlabor adjustment is quite sizable.

The PPS hospital market basket is comprised of labor- and nonlabor-related categories.[2] Table 1-1 shows the distribution of the current weights (based on 1987 data)

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[1] There is, however, a cost-of-living adjustment for Alaska and Hawaii.

[2] Even though capital-related costs are no longer being reimbursed on a "pass-through" basis, they still have not been incorporated into the market basket.

TABLE 1-1

PROSPECTIVE PAYMENT HOSPITAL MARKET BASKET[a]

Expenses Category	Weight	Percentage of Nonlabor Portion
1. Wages and Salaries	52.2%	—
2. Employee Benefits	9.5	—
3. Other Professional Fees	1.7	—
4. Energy and Utilities[b]	2.4	8.4%
A. Fuel, Oil, and Other Fuel[b]	0.6	2.1
B. Electricity[b]	1.1	3.8
C. Natural Gas[b]	0.3	1.0
D. Motor Gasoline[b]	0.2	0.7
E. Water and Sewerage[b]	0.2	0.7
5. Professional Liability Insurance[b]	1.4	4.9
6. All Other	32.8	—
A. All Other Products[b]		
(1) Pharmaceuticals[b]	3.9	13.6
(2) Food[b]		
(b) Direct Purchase[b]	2.1	7.3
(b) Contract Service[b]	1.2	4.2
(3) Chemicals[b]	3.1	10.8
(4) Medical Instruments[b]	2.7	9.4
(5) Photo Supplies[b]	2.6	9.1
(6) Rubber and Plastics[b]	2.3	8.0
(7) Paper Products[b]	1.4	4.9
(8) Apparel[b]	1.1	3.8
(9) Machines & Equipment[b]	0.5	1.7
(10) Miscellaneous Products[b]	0.8	2.8
Subtotal	21.8	76.2
B. All Other Services		
(1) Business Services	3.8	—
(2) Computer Services	2.0	—
(3) Transportation and Shipping[b]	1.2	4.2
(4) Telephone[b]	1.0	3.5
(5) Blood Services	0.6	—
(6) Postage	0.4	—
(7) All Other Labor Intensive	1.2	—
(8) All Other Nonlabor Intensive[b]	0.8	2.8
Subtotal	11.0	10.5
TOTAL	100.0	100.0

[a] Excludes capital-related costs. 1987-based weights. Individual categories may not sum to totals because of rounding.

[b] Considered nonlabor-related.

Source: Federal Register, September 4, 1990, Vol.55, No. 171, pp. 36079-36080.

HCFA assigns to hospital expense categories. Among the nonlabor expense categories are energy, professional liability insurance, pharmaceuticals, food, medical supplies, and telephone. There are only two nonlabor inputs whose overall weight in the market basket exceeds three percent: pharmaceuticals and chemicals. Moreover, they are the only two categories whose share exceeds 10 percent of the nonlabor portion. Some of these inputs, such as electricity, can only be purchased locally.[3] Inputs such as pharmaceuticals and medical supplies, however, need not be purchased from local vendors. Indeed, it may very well be that the markets for some nonlabor inputs are national.

1.3 ProPAC Report and Its Conclusions

ProPAC (1989) undertook an investigation of geographic price variation (similar to the one performed in Chapter 2 of this study). ProPAC gathered prices of nonlabor inputs, critiqued the quality of the data it collected, assessed whether the data it collected was sufficient to construct a nonlabor price index, and considered proxy measures for input prices. ProPAC also performed a qualitative analysis on the existence of a national market for nonlabor inputs by noting hospitals' affiliations with buying groups.

ProPAC was not able to find comprehensive price data by geographic region. In fact, ProPAC was only able to find usable data on four of the nonlabor components: energy, food, malpractice insurance, and telephone. ProPAC noted the sparseness of price data by geographic area and presented the following findings. First, available data on four of the nonlabor components of the market basket indicate area price variation. The amount of variation depended, in part, on the level to which prices were aggregated. ProPAC found that prices varied more at the state level than at the four-census region level. And, in some instances, intrastate price variation exceeded interstate price variation. Due to price data not being available for all MSAs (as well as other geographic area definitions) for the four input categories listed above, ProPAC's analysis of price variation was not as conclusive as would be desirable.

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[3] A hospital that is large enough could conceivably build its own electricity-generating power plant and purchase the fuel for it from a national supplier. In practice, the most hospitals do is to have back-up generators for area-wide power black/brown-outs.

ProPAC's second finding was that the available evidence suggested that nonlabor input prices did not necessarily move in the same direction. That is, while a given area's energy prices may be higher than in other areas, its food prices could be lower. ProPAC also noted that the growth of national markets, to the extent it occurs, would diminish the significance of local price variation. And ProPAC found evidence that many, if not most hospitals, either are members of a hospital system (chain) and/or participate in a purchasing group (such as an "alliance"), thus obtaining lower prices than if purchasing individually. ProPAC interpreted this evidence as suggesting, at a minimum, that hospitals had many available means by which "to obtain prices close to the national average." This, in turn, implies a national market for some nonlabor inputs.

From its findings, ProPAC concluded that available data was insufficient to determine the amount of nonlabor price variation by geographic area. It also concluded that if primary price data were collected, then it would be feasible to geographically adjust for nonlabor prices. Until this was done, ProPAC stated that use of a proxy measure, such as the PPS wage index, was not advisable.

The current study differs from the ProPAC study in three ways: (1) the current study analyzes more recent and additional sources of nonlabor input prices; (2) the current study performs analyzes of nonlabor input prices not performed by ProPAC; and (3) the current study analyses geographic variation in hospital nonlabor expenditures, which was not analyzed by ProPAC.

1.4 Overview of the Report

Chapter 2 reviews the available nonlabor price data, its correlation with the PPS hospital wage index, and difficulties in collecting adequate price data. Chapter 3 describes the measurement of hospital nonlabor expenditures per discharge from Medicare Cost Report data and from data from annual surveys conducted by the American Hospital Association. A tabular analysis of nonlabor (and labor) costs by hospital attribute and geographic location is presented in Chapter 4. Chapter 5 presents multivariate analyses of nonlabor expenditures. Finally, Chapter 6 summarizes this study's results and provides recommendations for further work in developing a PPS nonlabor cost adjustment.

2.0 MEASURES OF NONLABOR INPUT PRICES

In this chapter, we evaluate geographic variation in hospital nonlabor input prices. Section 2.1 reports the results of our conversations about nonlabor prices with hospital purchasing groups and other experts on hospital buying practices. Section 2.2 then reviews available secondary sources of nonlabor input prices. Section 2.3 discusses the strengths and weaknesses of the IMS America Hospital Supply Index and Pharmaceuticals databases. Section 2.4 presents a quantitative analysis of geographic variation in nonlabor input prices, including their inter-correlations and correlations with the PPS wage index. Section 2.5 gives our suggestions for assembling better secondary data on nonlabor input prices. Section 2.6 considers the needs/possibilities for primary data collection, including a review of the problems involved.

2.1 Anecdotal/Interview Evidence on Nonlabor Input Prices

As part of our search for information on nonlabor input prices, we spoke with representatives of hospital purchasing alliances, market research firms, hospital associations, trade journals, government agencies, and others. A complete list of the organizations that we contacted is given in Appendix A.

Most hospitals now belong to one or more purchasing groups that attempt to negotiate favorable prices for their members. Several of these alliances are quite large. American Health Care Systems has 937 member hospitals and Voluntary Hospitals of America has 668 members and 206 affiliated hospitals (Hospitals magazine, March 5, 1992). Several hospital buying groups refused to talk to us. The ones that did indicated that the prices that they negotiated for their members were essentially uniform nationally. However, they were unwilling to supply us with more detailed information.

Several hospital industry analysts we spoke to (See Appendix A for specifics) indicated that hospital supply prices might be lower in metropolitan areas, and higher in remote or rural areas because of distance from distribution/transportation centers. They also mentioned that larger hospitals are able to obtain volume purchasing discounts, and thus may pay less for nonlabor inputs. The consensus was that transportation costs and volume discounts were more significant influences on prices than regional differences.

Some nonlabor inputs appear to be bought in more local markets than others. The market for supplies and instruments was reported to be national, or even international, in scope. These inputs may be subject to minimal geographic price variation, except perhaps for transportation costs. Food, on the other hand, is often bought more locally and thus may be subject to more price variation.

None of the analysts we contacted suggested any comprehensive or detailed source of data on hospital nonlabor input prices, other than what is evaluated in the remainder of the chapter. In addition, no one suggested a source of data on the average relative expenditures of hospitals on the various nonlabor input categories that was superior to the PPS market basket.

2.2 Review/Assessment of Sources of Input Prices

Our search for sources of input price data to use in a PPS nonlabor input price index revealed that, apart from the IMS Hospital Supply Index,[1] there is data available for only four inputs. These input categories are food, energy, malpractice insurance, and telephone services, accounting for 29.45 percent of the nonlabor portion of the PPS market basket and 7.54 percent of the overall PPS market basket (exclusive of capital). Price data for many of the remaining nonlabor price inputs may be found in the Hospital Supply Index database, which is collected and maintained by IMS America. The Hospital Supply Index database is discussed in greater detail following a description and assessment of other available data.

Price data from the four categories food, energy, malpractice insurance, and telephone service, vary significantly in quality, level of aggregation, and extent of geographic coverage and therefore may not be suitable for use in a PPS nonlabor input price index. The sources of these data and the unit of measure are shown in Table 2-1. All data are for 1989, except FCC telephone prices which are for 1991.

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[1] In addition to the Hospital Supply database, IMS also has a pharmaceutical database which is maintained by a separate division. References in this report to the Hospital Supply Index implicitly refer to that database as well.

TABLE 2-1

NONLABOR INPUT PRICE DATA

Nonlabor Market Basket Category	Measure	Geographic Detail	Source
Food	Index of 27 retail grocery items.	199 MSA's	ACCRA, Cost of Living Index, 1989.
Energy	Dollars per million BTU's for commercial sector or residential sector.	51 states	DOE State Energy Price & Expenditure Report, 1989.
Energy	Average monthly total energy cost to residential household; includes electricity, oil, natural gas, coal, and wood.	199 MSA's	ACCRA, Cost of Living Index, 1989.
Malpractice Insurance	Average rate per bed for $1 million/$3 million liability coverage.	43 states	St. Paul's Hospital Update, 1989.
Telephone Service	Single-line business rate for unlimited local service.	88 cities	FCC Telephone Rates Update, 1991.
Telephone Service	Average monthly cost of a residential private line.	199 MSA's	ACCRA, Cost of Living Index, 1989.

Notes:

ACCRA = American Chamber of Commerce Researchers Association.
DOE = U.S. Department of Energy.
FCC = Federal Communications Commission.

Food Prices

Food prices were taken from a cost-of-living index compiled by the American Chamber of Commerce Researchers Association (ACCRA). The ACCRA cost-of-living index offers comparative data for 269 cities, both metropolitan and non-metropolitan. The food sub-index is constructed from surveys of the retail prices of 27 grocery items such as dairy products and meats. The number and type of stores from which the prices are taken are supposed to reflect the size and consumption patterns of the local community. The residential location of a "midmanagement executive" household is used to choose the neighborhoods in which to obtain prices. Whenever possible, national brands are specified to insure uniformity across regions. When that is not possible the "lowest price" of the item is used.[2]

There are two major limitations of the ACCRA data. First, the accuracy of the data depends on the voluntary cooperation of the participating chambers of commerce who may or may not obtain and report the data consistently and accurately. Each participating chamber of commerce decides independently how to gather their information. This lack of uniformity may effect the accuracy of the data in making regional comparisons. Secondly, the retail prices surveyed may not be an accurate reflection of what hospitals pay. This is almost certainly true on an absolute basis given that hospitals probably do not pay retail prices and it is also possible that the data do not reflect the relative differences in prices across regions either.

Energy Prices

Energy prices were obtained from ACCRA and from the State Energy Price and Expenditure Report compiled by the U.S. Department of Energy (DOE). ACCRA measures total energy price as the average monthly expenditures for a family of four for consumption of various types of energy. Average monthly cost (expenditure) is calculated at the current rates for average monthly consumption during the previous 12 months. The total energy cost measure is a combination of two sub categories: electric power, and other fuel sources which include oil, natural gas, coal, and wood. As with the ACCRA food prices, it is unknown whether these residential energy prices are an accurate indicator of the relative energy price differences faced by hospitals.

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[2] "Lowest price" is the reported average of the lowest prices found in all stores surveyed.

The DOE's State Energy Price and Expenditure Report contains estimates of energy prices by economic sector. In many cases reliable information for all sectors and/or for all states does not exist. Therefore, estimates are often based on a variety of surrogate measures that are selected on the basis of availability and applicability as indicators.[3] Prices for both the commercial sector and the residential sector are available. The commercial sector best approximates the economic sector of hospitals. The residential sector data will be compared to ACCRA's residential energy data.

The data in the State Price and Expenditure Report represents a consumption weighted average over an entire state. This ignores the difference in rural and urban prices which may vary significantly from a state's weighted average. It is possible that there may be more variation in energy prices within a particular state than between two neighboring states. In addition, the consumption pattern for the commercial sector as a whole may not be representative of the consumption patterns of hospitals, leading to estimates that are non-representative.

Malpractice Insurance Premiums

Malpractice insurance prices (premiums) were obtained from the St. Paul's Hospital Update, an annual report to policyholders. Data on proposed average acute care bed rates for mature claims-made coverage[4] is available for 47 states, although only 43 states can be compared on the basis of liability limit levels. These 43 states have claims liability limits at the

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[3] Documentation on the specific measures used to estimate missing data can be found on p. 175 of the State Energy Price and Expenditure Report, 1989.

[4] Mature claims rates are established in the 5th year of coverage.

$1 million/$3 million level.[5] Pennsylvania, Wisconsin, Kansas, and Indiana have lower liability coverage limits mandated by the state.

St. Paul is the largest provider of medical malpractice insurance to hospitals, providing insurance to approximately 1,500 hospitals nationwide. However, their market share varies across regions; they are not always the dominant provider in a state. In addition, the rates do not account for excess umbrella policies that are purchased by the hospitals. Especially in the four states that have lower liability claims limits, hospitals are often covered by patient compensation funds which should be accounted for. The four states with lower liability limits were not used in our analyses.

Telephone Rates

Telephone prices were obtained from ACCRA and from the Federal Communications Commission (FCC) Telephone Rates Update report. ACCRA measures the average monthly cost of a private residential line. This price includes all location specific charges such as the basic monthly rate, additional local use charges, and any other mandatory monthly charges. As with the other data collected by ACCRA, it is difficult to know whether this measure is a good approximation of the relative differences in telephone costs to hospitals.

The FCC publication presents telephone index data from the Bureau of Labor Statistics (BLS) and from the Common Carrier Bureau. The measure used in the analysis is the single business line rate, obtained from a survey of 95 cities by the Common Carrier Bureau. The rate measured is for unlimited service in the 54 cities where it is available. In the remaining cities, a measured rate for 200 calls is used. A residential monthly rate comparable to the measure from ACCRA is also available from the FCC. However, although the commercial and residential rates generally tend to move together, the FCC residential rate was not used because hospitals are more likely to use business rates which often differ from residential rates.

Problems with the FCC data include the following. Geographic coverage is limited to 95 cities in 41 states. The single line business rate is not the best estimate of telephone prices for hospitals, because they are likely to use a multi-line rate. Hospitals are more likely to fall under a multi-line rate, as many different lines are usually needed. There is a problem in using the line rate as a direct measure of the total price of telephone services. Line rates represent only part of the total cost of telephone use and the fraction of the total cost that they represent varies by state and by the calling patterns of the hospital. What distance constitutes toll usage differs widely from state to state. In addition, hospitals located in metro areas will have different toll usage patterns than hospitals located in rural areas. Hence, telephone costs may differ more within a state than between states.

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[5] This means $1 million per occurence and $3 million per year, regardless of coverage.

2.3 IMS America Hospital Supply Index

Price data for many of the remaining nonlabor components can be found in the Hospital Supply Index database. Items covered by neither the HSI nor the other available sources are transportation, miscellaneous products, and minor machinery. The HSI database, which currently contains 350 hospitals and goes back 20 years, is collected and maintained by IMS America, a market research company that focuses on the hospital supply and pharmaceuticals industry. The IMS HSI appears to be the only secondary data available that can provide geographic detail on hospital supply prices, and as such, warrants consideration. The HSI database is constructed from price information collected from acute care hospitals.

IMS classifies the annual list of hospitals from the American Hospital Association (AHA) Guide into seven bed sizes and nine geographic regions. A statistically representative sample of each of these 63 cells is then taken. The same hospitals are sampled each year unless changes in bedsize or bankruptcy alter the sample size within a particular cell. Secondary selection criteria include metropolitan versus non-metropolitan, teaching versus non-teaching, and purchasing group participation.

IMS collects paid invoices from these hospitals to the manufacturer on a monthly basis. The invoices may reflect discounts from the manufacturer if they are given on specific products and not on the total amount purchased. By comparing the line item price on the invoice with the manufacturers list price it may be possible to determine the relative size of a discount for a specific product. Any discounts offered after the time at which the invoice was issued, such as rebates, are not recorded. The invoices are stored on microfilm or on computer tape.

There are several drawbacks of the Hospital Supply Index. Sampling, while stratified by bedsize/region cells, is not random and therefore may not be representative of the population. Many hospitals refuse to participate, even though IMS provides participating hospitals with free market share reports. Nonparticipating hospitals may have different characteristics than participating hospitals. (Possibly the IMS data could be weighted to compensate for the nonrandomness of the sample.) The sample size of 350 out a universe of 5,600 might be too small. Because this sample of 350 is divided into 63 cells, large price variations within a cell could produce inaccurate results.

The price data may or may not reflect discounts that hospitals receive from manufacturers. Without some method of obtaining similar data for all hospitals, price comparisons of any nature may be meaningless. IMS has indicated that the percentage discount is not uniform enough across hospitals or across regions to give an accurate estimate of actual transaction prices based on the manufacturers list price. The possibility of large variations in discounts (e.g., due to volume purchases) makes the representativeness of the prices questionable. Also, there are some difficulties in matching HSI's 38 supply categories to the PPS market basket.

IMS uses a numerical coding scheme to classify hospital supply purchases. The most detailed product categories are identified by 5-digit codes. There are more than 1000 5-digit codes. In 1992, IMS charged $500 to provide unit prices for a 5-digit product category in each of the 9 Census Divisions. IMS representatives stated that purchasing unit prices for all 5-digit product categories would cost approximately $800,000. However, IMS gives a 50 percent discount for prices more than two quarters old. Purchasing regional prices for a sample of 100 products at the discounted price would therefore cost $25,000. This size sample should be sufficient to determine the usefulness of the IMS Hospital Supply Index. However, obtaining prices by metropolitan/nonmetropolitan, bedsize class, etc. would cost extra.

There is another division within IMS America that maintains a database on pharmaceutical prices, organized by therapeutic class. Hospitals are classified into five bed sizes and nine geographic regions; sampling procedures are similar to HSI's. Although the hospitals used are not always identical, (N=380) many of the same hospitals are used by both divisions. Price information can be obtained by requesting a special report.

The pharmaceutical database has all of the same problems as the HSI database. Data for the pharmaceutical database are collected by therapeutic class and for specific prescription size levels. This means that data is collected for a particular type of drug for several different drug weight classifications. Mean price statistics acquired from aggregating up to a single product category or across several product categories would not be very meaningful without the use of a complicated weighting scheme.

Exhibit 2-1 is a typical "price" report from IMS America's Pharmaceutical Division. The combined dollar volume is given for several price ranges within three bed divisions for the nine Census Divisions. There is wide variation in the availability of data throughout the regions. In the West North Central region information is available only from hospitals with 200-299 beds. It is questionable whether this limited sample is truly representative of the price of the drug in this region. In addition, the prices recorded exhibit surprisingly high variation for such a specific drug class and weight, raising doubts as to their representativeness. Unit prices for the regions can be obtained through a special report. However, these prices would only be for specific size or weight classes within the various therapeutic groups, raising the possibility that meaningful aggregate price data cannot be obtained.

Meaningful data might be obtained from the pharmaceutical database by acquiring prices for only the largest expenditure items. Expenditure percentages for each weight category of each drug could be calculated and used to construct a more general aggregate price for pharmaceuticals using the expenditure share as a weight. This would be easier to do with the pharmaceutical database than with the HSI because the HSI data is significantly more heterogeneous.

A final concern is the proprietary nature of both databases. Access to the data is usually limited to ordering special reports. IMS's methodology cannot be documented nor can the validity of the price data be ascertained without further investigation and greater cooperation by IMS.

EXHIBIT 2-1

IMS AMERICA, LTD
U.S. HOSPITAL PRICE ANALYSIS
FULL YEAR 1989
INDIRECT (OR COMBINED) DOLLAR VOLUME

	REGIONAL DISTRIBUTION								
GENERIC ANTIBIOTIC	NEW ENGLAND	MIDDLE ATLANTIC	SOUTH ATLANTIC	EAST NORTH CENTRAL	EAST SOUTH CENTRAL	WEST NORTH CENTRAL	WEST SOUTH CENTRAL	MOUNTAIN	PACIFIC
CAPS 250MG 100UD									
TOTAL	60,113	100,932	43,439	50,073	2,212	1,186	5,113	3,011	3,946
1 - 99 BEDS	6,690	3,186	4,475	2,427	329		899	536	103
LESS THAN $15.48	622								
$15.48 - $21.26	3,852	866	521	417			104	536	103
$21.27 - $27.05	2,216		1,120						
$38.64 - $44.42				275					
$44.43 - $50.21			2,834		329				
$50.22 - $56.00		1,895							
GREATER THAN $56.00							794		
NO PRICE SUPPLIED		425		1,735					
100 - 199 BEDS	9,222	21,675	13,971	9,809			3,969		2,454
LESS THAN $15.48				419					
$15.48 - $21.26	3,785	14,322		1,006			526		2,148
$21.27 - $27.05	5,437						305		306
$38.64 - $44.42				2,083					
$44.43 - $50.21		6,931	288				3,138		
$50.22 - $56.00			13,683						
NO PRICE SUPPLIED		422		6,300					
200 - 299 BEDS	15,028	16,623	10,483	6,846	519	1,186		2,176	506
LESS THAN $15.48				503					
$15.48 - $21.26	3,528	5,399	4,430	2,270	205			1,563	506
$21.27 - $27.05	10,402.	732	5,560	2,949				613	
$44.43 - $50.21	1,098	5,173	494		313	1,186			
$50.22 - $56.00		4,708							
NO PRICE SUPPLIED		612		1,125					

An earlier evaluation of pharmaceutical prices (Hendricks et al, 1987) concluded that there is little geographic variation in drug prices. This report also emphasized the great expense of maintaining a pharmaceutical price index given the volatility of drug prices, and variations in the brands of drugs used in different areas. However, the report's conclusion that little geographic drug price variation exists was based on limited data, and cannot be regarded as definitive.

We did not obtain IMS's HSI data because of its expense. Additionally, given the expense in obtaining the data, the properties of the data would have to be carefully examined before committing large sums of money to its purchase.[6]

2.4 Analysis of Geographic Variation/Correlation of Input Price Data

In this section available nonlabor input price data is analyzed both with respect to geographic variation and correlation with the PPS area wage index. First, descriptive statistics are presented and the variance of each input price is discussed in relation to the PPS wage index. Then, an analysis of geographic variation in input prices is performed using a set of indexed state values. Following that, correlations among the input prices and between the input price and the wage index are explored. Lastly, bivariate regressions of the input prices on the PPS wage index are estimated to determine the wage index's suitability as an indicator of nonlabor input price variation.

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[6] ProPAC (1989) commented adversely on the HSI, especially with regard to its sample size and what ProPAC called the "validity and reliability of the hospital invoice data." ProPAC further stated that HSI data do not reflect discounts. ProPAC is only partially correct with regard to discounts: line item discounts are reflected in HSI data but not discounts that are only applied to the grand total invoice amount. It is not clear how ProPAC arrived at its conclusions regarding the HSI data. For instance, it is not stated whether ProPAC attempted to get detailed information regarding the representativeness of the hospital sample size. If IMS followed its usual business practices, such information would not have been forthcoming. It may require a special attempt, including meetings with IMS executives and statisticians, to obtain the information needed to determine whether the HSI data is useful for constructing a medical supply index according to HCFA's specifications rather than IMS's standardized format.

2.4.1 Descriptive Statistics

Descriptive statistics on the available price data as well as the PPS wage index are shown in Tables 2-2 and 2-3. The price data are indexed to a national average of 1.0 in Table 2-3 to facilitate comparisons across data sources. Statistics on three of the seven variables-malpractice insurance, commercial energy (DOE), and residential energy (DOE) were computed at the state level; while statistics on the remaining four variables – telephone service (FCC), food (ACCRA), residential energy (ACCRA), telephone service (ACCRA) and the PPS wage index, were computed at the MSA/state non-metro level. In Table 2-2 all amounts listed are actual dollar values, with the exception of food (which was already indexed by ACCRA) and the PPS wage index. If, in the case of the MSA/state non-metro level data, multiple observations within a metropolitan or non-metropolitan area were available, a population-weighted average at the MSA/state non-metro level was tabulated to derive a single value for that area.

In Table 2-3 an overall nonlabor index was constructed at the MSA/state non-metro level. The overall nonlabor index is the sum of four index values weighted by their shares in the PPS nonlabor market basket normalized to 100 percent. It represents 29.45 percent of the total nonlabor market basket. If data were not available for a MSA/state non-metro area, the aggregate state index value was used in its place. For example, for the FCC commercial phone rate data, a state index value can be computed for the state of New York but not for all MSA/state non-metro areas within New York. If data for a particular MSA/state non-metro area within the state of New York was not available, the state index value, which is computed from a simple average of all the MSA/state non-metro areas within New York, was used. This accounts for the greater number of observations for the overall nonlabor index variable than for the ACCRA data.

The categories used to construct the overall index and their respective normalized weights are: malpractice insurance (15.79%), commercial energy-DOE (29.85%), commercial telephone-FCC (10.73%), and residential food-ACCRA (43.63%). DOE's measure of commercial energy and the FCC's measure of telephone service costs were chosen over the residential measures because they best approximate hospital's economic sector. In addition,

TABLE 2-2

DESCRIPTIVE STATISTICS ON NONLABOR INPUT PRICES

	Malpractice Insurance	Commercial Energy (DOE)	Residential Energy (DOE)	Commercial Telephone (FCC)	Retail Food (ACCRA)[a]	Residential Telephone (ACCRA)	Residential Energy (ACCRA)	1988 PPS Wage Index[b]
N	43	51	51	88	199	199	199	359
Mean	$1,956	$11	$12	$39	100	$19	$111	0.94
Standard Deviation	882	2	3	10	6	4	20	0.13
CV	45	20	28	26	6	21	18	14
PERCENTILES:								
Maximum	4,572	15	26	69	130	40	212	1.48
90	3,127	13	14	52	106	24	135	1.12
75	2,408	12	12	45	103	22	124	1.02
50	1,230	10	11	38	99	19	110	0.93
25	1,342	9	10	31	96	16	98	0.86
10	994	8	9	27	93	15	91	0.80
Minimum	$632	$7	$8	$18	86	$12	$63	0.69

[a] Indexed to national average = 100.

[b] Indexed to weighted national average = 1.0.

Source: See Table 1.

TABLE 2-3

DESCRIPTIVE STATISTICS ON NONLABOR INPUT PRICES INDEXED TO A WEIGHTED NATIONAL AVERAGE OF 1.0

	Malpractice Insurance[a]	Commercial Energy (DOE)[a]	Residential Energy (DOE)[a]	Commercial Telephone (FCC)[b]	Retail Food (ACCRA)[b]	Residential Telephone (ACCRA)[b]	Residential Energy (ACCRA)[b]	Overall Nonlabor Index[b,c]	1988 PPS Wage Index[b]
N	43	51	51	88	199	199	199	314	359
Mean	0.88	0.92	0.97	1.04	1.00	0.99	0.96	0.99	0.94
Standard Deviation	0.40	0.18	0.27	0.27	0.06	0.21	0.18	0.11	0.13
CV	45	20	28	26	6	21	18	11	14
PERCENTILES:									
Maximum	2.06	1.33	2.17	1.85	1.30	2.05	1.82	1.25	1.48
90	1.41	1.16	1.18	1.39	1.06	1.25	1.16	1.13	1.12
75	1.09	1.06	1.02	1.21	1.03	1.10	1.07	1.08	1.02
50	0.78	0.90	0.90	1.03	0.99	0.96	0.95	0.97	0.93
25	0.60	0.75	0.81	0.83	0.96	0.83	0.84	0.90	0.86
10	0.45	0.72	0.74	0.72	0.93	0.75	0.78	0.84	0.80
Minimum	0.28	0.61	0.70	0.49	0.86	0.61	0.54	0.75	0.69

[a] State values indexed by state-population-weighted national average.

[b] MSA/state non-metro values indexed by MSA/state non-metro-population-weighted national average.

[c] Sum of nonlabor price indexes weighted by normalized shares of the PPS nonlabor market basket. Overall nonlabor index = malpractice insurance (15.79%) + commercial energy - DOE (29.85%) + commercial telephone - FCC (10.73%) + retail food - ACCRA (43.63%). For areas in which MSA/state non-metro values were not available, a state index value was substituted.

Source: See Table 1.

the methodology behind the FCC and the DOE reports is better documented and their data are probably more reliable.

Malpractice insurance prices have the greatest amount of variability of all the input prices, having more than three times the variability of the PPS wage index. Energy and telephone prices have less variability but are still more variable than the wage index. The only input price that is less variable than the wage index is food, with a variance of less than half that of the wage index. The overall nonlabor index is slightly less variable than the wage index. If the overall nonlabor index is representative of the variance in nonlabor prices to hospitals, then wages paid by hospitals are slightly more variable than nonlabor prices. The hypothesis of uniform prices nationwide for each nonlabor input is rejected by these data. On the contrary, many nonlabor prices display considerable variation, which could warrant a geographic payment adjustment.

The two measures of residential energy, ACCRA and DOE, differ significantly in dollar amounts, the mean value for ACCRA ($111) being more than nine times the mean value for the DOE ($12). This is because the two variables are measuring different things. While the ACCRA energy prices measure average monthly expenditure to a family, DOE energy prices represent the dollar cost per million Btu's (an unit price) for the residential sector of a state. This is an important difference because it is possible that a state that has a low cost per million Btu's (as measured by DOE) may also have a high average monthly residential total energy expenditure (as measured by ACCRA), or vice-versa, due to weather conditions. Alaska, for example, has one of the highest energy costs under ACCRA's measure but has one of the lowest energy prices under DOE's measure. Alaska may pay very little on a dollars per million Btu's rate measure but because of extreme weather conditions (contributing to increased usage), the actual monthly energy cost may be quite high.[7]

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[7] In 1989 Alaska ranked 47th in energy prices by state but ranked first in energy expenditure per capita by state, State Energy Price and Expenditure Report, 1989.

Commercial telephone prices from the FCC are significantly higher than the residential phone prices collected by ACCRA, though both measures have nearly the same level of variability. The price difference is to be expected, as commercial line rates are typically higher than residential line rates. These differences between data that at first glance measure a similar price indicates that it is essential to understand precisely the price or expenditure that is being measured.

2.4.2 State Variation in Input Prices

State nonlabor price indexes are shown in Table 2-4. Indexes were constructed at the state level due to a lack of sufficient data to construct MSA/state-non metro level indexes. For example, the FCC commerical phone prices exist for only 88 MSA/state non-metro regions. Data available at the MSA/state non-metro level was aggregated to the state level by taking a simple unweighted average. Then, to construct the index, all state values were divided by a national state population weighted average. As mentioned earlier, the overall nonlabor index is the sum of four index values (malpractice insurance, commercial energy-DOE, commercial telephone-FCC, residential food-ACCRA) weighted by their normalized shares in the PPS nonlabor market basket.

The index values for malpractice insurance range from 0.28 (South Carolina) to 2.06 (Rhode Island), revealing significant variation in prices between states. Prices vary by state based on the experience of the insurance underwriter (St. Paul--i.e., they are experience-rated), and not by any general region of the country. It is possible that for states in which St. Paul is not a major underwriter that the data may be less representative.

Index values for commercial energy, as measured by DOE, range from 0.61 (Minnesota) to 1.33 (Arizona), have much less variation than malpractice insurance prices. Commercial energy prices vary more by region of the country than do malpractice insurance prices. For example, the average index value for the New England area is 1.11 compared with 0.93 for the West South Central region. However, there are still significant differences between bordering states e.g., Tennessee (0.86) and Georgia (1.20) due primarily to differences in consumption patterns and because of Georgia's higher cost per million Btu's for electricity.

TABLE 2-4

NONLABOR INPUT PRICE INDEXES BY STATE[a]

State	Malpractice Insurance[a]	Commercial Energy (DOC)[a]	Residential Energy (DOC)[a]	Commercial Telephone (FCC)[b]	Retail Food (ACCRA)[b]	Residential Telephone (ACCRA)[b]	Residential Energy (ACCRA)[b]	Overall Nonlabor Index[b,c]	1988 PPS Wage Index[b]
Alabama	1.06	0.75	1.09	1.50	0.95	1.26	0.90	0.97	0.84
Alaska	0.85	0.70	0.83	0.40	1.29	0.75	1.20	0.96	1.44
Arizona	1.50	1.33	1.60	0.78	1.00	0.04	0.06	1.19	1.00
Arkansas	0.32	0.92	1.01	1.01	0.96	1.29	0.95	0.05	0.82
California	1.40	1.27	1.00	0.71	1.05	0.75	1.00	1.15	1.25
Colorado	1.03	0.80	0.73	1.00	0.96	0.90	0.79	0.94	1.01
Connecticut	0.70	1.27	1.02	0.03	1.08	1.00	1.31	1.03	1.23
Delaware	1.06	1.09	1.07	--	1.05	0.03	1.14	--	1.02
District of Columbia	--	0.97	0.80	0.84	--	--	--	--	1.14
Florida	1.22	1.33	1.76	0.97	0.97	0.88	1.04	1.11	0.97
Georgia	0.73	1.20	1.09	1.18	0.97	1.03	1.06	1.02	0.80
Hawaii	--	0.74	2.27	0.95	0.97	0.70	0.99	--	1.10
Idaho	1.09	0.75	0.89	--	0.91	0.07	0.75	--	0.90
Illinois	0.93	0.95	0.77	0.84	0.99	1.04	1.02	0.95	0.96
Indiana	--	0.01	0.83	1.24	0.99	1.03	0.90	--	0.95
Iowa	0.45	0.72	0.01	0.69	0.95	1.26	0.09	0.77	0.91
Kansas	--	0.74	0.79	--	0.94	0.09	0.94	--	0.93
Kentucky	0.70	0.78	0.83	1.44	0.97	1.23	0.07	0.92	0.87
Louisiana	1.01	1.03	1.18	1.27	0.97	1.13	1.18	1.03	0.87
Maine	0.54	0.95	0.99	0.96	--	--	--	--	0.93
Maryland	0.64	1.00	0.98	1.01	0.96	1.20	0.91	0.92	0.93
Massachusetts	--	1.06	0.90	0.00	1.05	0.79	1.07	--	1.12
Michigan	1.26	0.82	0.70	0.81	1.03	1.02	0.90	0.98	1.06
Minnesota	0.62	0.61	0.74	1.15	0.95	1.11	0.95	0.02	1.03
Mississippi	0.62	1.07	1.11	1.34	1.00	1.42	0.92	1.00	0.02
Missouri	0.67	0.94	0.87	1.07	0.95	0.07	0.90	0.92	0.91
Montana	0.70	0.67	0.71	1.00	1.03	1.36	0.90	0.89	0.96
Nebraska	0.47	0.74	0.76	1.14	0.92	0.97	0.87	0.02	0.87
Nevada	0.94	0.87	0.96	--	0.97	0.72	0.00	--	1.11
New Hampshire	0.76	1.05	1.02	--	1.04	1.00	1.26	--	1.03
New Jersey	0.05	1.06	0.93	--	--	--	--	--	1.00
New Mexico	--	0.90	0.93	1.33	1.01	1.42	0.06	--	0.92
New York	0.70	1.15	0.90	1.30	1.04	1.40	1.27	1.06	1.02
North Carolina	0.47	1.12	1.29	0.90	0.95	0.95	0.96	0.93	0.09
North Dakota	0.45	0.69	0.80	--	1.01	1.01	0.72	--	0.94
Ohio	0.59	0.92	0.01	1.10	0.95	1.13	1.00	0.90	0.97
Oklahoma	1.21	0.06	0.87	--	1.00	1.11	1.00	--	0.08
Oregon	1.31	0.87	0.91	1.12	0.97	0.97	0.63	1.01	1.07
Pennsylvania	--	0.94	0.90	0.79	1.01	0.87	1.26	--	0.99
Rhode Island	2.06	1.00	0.08	1.04	--	--	--	--	1.10
South Carolina	0.28	1.15	1.31	0.95	0.95	1.15	0.06	0.90	0.88
South Dakota	0.45	0.76	0.89	--	1.02	1.04	1.01	--	0.04
Tennessee	0.75	0.06	1.02	1.29	0.95	1.04	0.06	0.93	0.09
Texas	1.79	0.89	1.11	0.00	1.02	0.04	1.02	1.00	0.93
Utah	0.74	0.85	0.71	0.74	0.92	1.00	0.05	0.05	0.96
Vermont	0.60	1.16	1.02	--	--	--	--	--	0.96
Virginia	0.44	1.02	1.10	1.23	1.01	0.78	0.78	0.95	0.89
Washington	0.93	0.73	0.86	1.06	1.03	0.06	0.00	0.93	1.10

[a] State values indexed by state-population-weighted national average.

[b] State values derived by unweighted average of the values within each state; state values then indexed by state-population-weighted national average.

[c] Sum of nonlabor indexes weighted by normalized shares of the PPS nonlabor market basket. Overall nonlabor index = malpractice insurance (15.79%) + commercial energy, DOE (29.85%) + commercial telephone, FCC (10.73%) + retail food, ACCRA (43.63%).

Source: See Table 1.

Commercial telephone index prices, as measured by the FCC have significant variation as well, ranging from 0.48 (Alaska) to 1.71 (West Virginia). These differences may, to some extent, reflect wide variation in state taxes. Alaska, because of the revenues obtained from petroleum resources, often does not charge state taxes at all while West Virginia has very high state taxes on telephone service.

Indexed food prices exhibit less variation, ranging from 0.91 (Idaho) to 1.29 (Alaska). Most of the variation can be explained based on the states' location relative to food sources and the states' wage rates.

The overall nonlabor index reveals that, at least for the four component price measures, there are significant differences in nonlabor costs throughout geographic regions. Arizona has the highest overall nonlabor cost with an index value of 1.19 while Iowa has the lowest cost with an index value of 0.77. By way of comparison, Arizona has an average PPS wage index (1.00), and Iowa has a relatively low wage index value (0.91).

A high wage rate does not necessarily imply high nonlabor cost. Table 2-4 shows that several states which have higher than average nonlabor costs (Georgia, Louisiana, and Mississippi) have lower than average wage rates. Other states (Minnesota and Washington) have lower than average nonlabor costs and higher than average wage rates. This suggests that on a state level the PPS wage index is not a good indicator of nonlabor costs.

States with the highest price index values (Arizona, California, Florida, Texas, and West Virginia) all have high index values for malpractice insurance, the most variable price index component. Arizona, California, and Florida all have high index values for commercial energy prices and food as well, though not on commercial telephone prices. Texas and West Virginia have fairly high food index values and West Virginia has the highest index value for commercial telephone prices.

The states with the lowest price index values (Iowa, Minnesota, Nebraska, Arkansas, and Ohio) all have low index values for malpractice insurance and food. Iowa, Minnesota, and Nebraska have low index values for commercial energy prices as well though Arkansas and Ohio's commercial energy index prices are fairly average. All five states except Iowa have high commercial telephone index prices. Telephone prices, both for states with high index values and with states with low index values, do not appear to be significant in determining the overall price index value.

Table 2-5 summarizes the distribution of nonlabor input prices across states. Percentage deviations of the highest-priced and lowest-priced states from the national average indicate the extremes of input price variation across states. Deviations of the 75th and 25th percentile states show more typical input price variation. In addition to unweighted percentage deviations from national average prices, deviations weighted by each input's share of the PPS market basket are given to indicate the effect of an input's price variation on hospital costs. Ranges are sums of the absolute values of the high/low and 75th/25th percentile deviations from the national average.

The range of prices for the four inputs across states is substantial, from 38 percent for food to 178 percent for malpractice insurance. Typical variation is much less, from 8 percent for food to 48 percent for malpractice. Each input's share of total costs is small, so that the extreme range weighted by market basket share varies from only 1.2 percent for telephone to 2.5 percent for malpractice insurance. The market-basket-weighted typical deviation is 0.3 percent for food and telephone and 0.7 percent for energy and malpractice. When the four input prices are averaged into an overall index, the extreme range across states is 41 percent, or 3.3 percent weighted by the market basket share of the four inputs. More typical state variation in the overall index is 12 percent, or 0.9 percent weighted by market basket share.

2.4.3 Correlation Analysis

Correlation coefficients for the input prices as well as for the PPS wage index are shown in Table 2-6. Few of the input prices are highly correlated with each other. This implies that an overall index that is an average of prices for nonlabor inputs will be less variable than many of the individual prices. Thus, the case for a nonlabor adjustment in PPS may be less compelling on an overall basis than for particular inputs. Nevertheless, the generally positive correlation among prices in Table 2-6 implies that the overall nonlabor

TABLE 2-5

NONLABOR INPUT PRICE VARIATION ACROSS STATES

		DEVIATION FROM NATIONAL AVERAGE				RANGE	
Input		High State	75th% State	25th% State	Low State	High/ Low	75th/ 25th%
Food	Unweighted	29%	3%	-5%	-9%	38%	8%
	Weighted by Market Basket Share	1.0	0.1	-0.2	-0.3	1.3	0.3
Commercial Energy	Unweighted	33	6	-25	-39	72	31
	Weighted by Market Basket Share	0.7	0.1	-0.6	-0.9	1.6	0.7
Commercial Telephone	Unweighted	71	20	-14	-52	123	34
	Weighted by Market Basket Share	0.7	0.2	-0.1	-0.5	1.2	0.3
Malpractice Insurance	Unweighted	106	9	-40	-72	178	48
	Weighted by Market Basket Share	1.5	0.1	-0.6	-1.0	2.5	0.7
Overall Nonlabor Index	Unweighted	19	3	-9	-23	41	12
	Weighted by Market Basket Share	1.5	0.2	-0.7	-1.8	3.3	0.9

Source: Table 1-1 and Table 2-4.

TABLE 2-6

CORRELATIONS AMONG NONLABOR INPUT PRICES

	Malpractice Insurance	Commercial Energy (DOE)	Residential Energy (DOE)	Commercial Telephone (FCC)	Retail Food (ACCRA)	Residential Telephone (ACCRA)	Residential Energy (ACCRA)	Overall Nonlabor Index	1988 PPS Wage Index
Malpractice Insurance	1.00 (43)								
Commercial Energy (DOE)	0.12 (43)	1.00 (51)							
Residential Energy (DOE)	0.08 (43)	0.48 (51)	1.00 (51)						
Commercial Telephone (FCC)	-0.06 (33)	-0.17 (40)	-0.05 (40)	1.00 (88)					
Retail Food (ACCRA)	0.25 (39)	0.12 (46)	-0.01 (46)	-0.36 (57)	1.00 (199)				
Residential Telephone (ACCRA)	-0.23 (39)	-0.11 (46)	-0.25 (46)	0.65 (57)	-0.12 (199)	1.00 (199)			
Residential Energy (ACCRA)	0.01 (39)	0.37 (46)	0.15 (46)	-0.07 (57)	0.32 (199)	0.07 (199)	1.00 (199)		
Overall nonlabor Index	0.76 (31)	0.66 (31)	0.58 (31)	-0.13 (80)	0.42 (176)	-0.24 (176)	0.19 (176)	1.00 (314)	
1988 PPS Wage Index	0.33 (43)	0.10 (51)	-0.01 (51)	-0.27 (87)	0.39 (194)	-0.16 (194)	0.18 (194)	0.31 (304)	1.00 (359)

Note: The number of observations for the correlation is in parentheses.

Source: See Table 1.

index will retain significant geographic variation. The overall nonlabor index is highly correlated with several of the input prices largely because it was derived from a weighted sum of these input prices. FCC commercial telephone service prices are negatively correlated with the overall index largely because FCC phone prices are negatively correlated with all other input prices except for the ACCRA phone input price.

The two measures of telephone service prices (ACCRA-residential and FCC-commercial) are highly correlated (.65) indicating that the two measures may be measuring similar costs and that residential rate costs are correlated with commercial rate costs. Energy input price measures (ACCRA-residential and DOE-residential and commercial), however, are not highly correlated with each other. In fact, the ACCRA measure of residential energy cost is more highly correlated with the DOE commercial energy price than with the DOE residential energy price. As before, this is evidence that ACCRA and DOE are not measuring the same costs.

The two DOE measures of energy prices (commercial and residential) are not as highly correlated with each other (.48) as one might expect. This is largely due to differences in consumption patterns within the two sectors between states, as the DOE measures are consumption-weighted averages. In Hawaii, for example, the residential energy rate is more than three times the commercial rate (see Table 2-4). In 1987, Hawaii's commercial sector increased its consumption of residual fuel, then a minor component of total energy cost, by a factor of 10, and then again by a factor of 7 from 1987 to 1989, greatly increasing residual fuel's share of the consumption basket.[8] The low cost of residual fuel combined with the huge increase in consumption drove the total energy cost of the commercial sector down to its present low level.

Commercial and residential sectors exhibit heterogeneous consumption patterns across states, which may account for the moderately high correlation coefficient. In order to obtain a representative energy cost for hospitals, hospitals' energy consumption patterns would have to be known so that an accurate consumption weighted average could be obtained. It is not known whether hospitals across geographic regions exhibit homogeneous energy consumption patterns.

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[8] State Energy Data Report, 1960-1989, p. 59.

None of the price variables exhibit a high correlation with the PPS wage index though two, malpractice insurance (.33) and food (.39), exhibit some correlation. At the state level (not shown), food prices do exhibit a fairly high correlation with the wage rate (.68), indicating that the wage rate may have some direct effect on food prices (or vice-versa) but not for small geographic areas. Other price variables exhibited either a very low positive or a negative correlation with the wage rate.

2.4.4 Bivariate Regressions on the PPS Wage Index

Lastly, bivariate regressions were run using the PPS wage index to predict each of the nonlabor price variables, including the overall nonlabor price index. The results of these regressions are presented in Table 2-7.

Most of the regressions were statistically significant but the adjusted R-squared values, which range from -0.02 to 0.15 show that very little of the variation in the dependent variables explained by the wage index, though as with the correlation matrix, the wage index is more highly correlated with malpractice insurance (0.08) and food prices (0.15) than with the other input price variables. The regression for the total nonlabor index is significant, but it has a fairly low (0.09) adjusted R-squared value. Most of the slope coefficients are less than one, indicating that to the extent nonlabor price variation is correlated with the wage index, the variation is less than proportional. Overall, the regressions indicate that the PPS wage index is not a good predictor of available nonlabor input prices.

2.5 Input Prices from Non-Hospital Sources

The four items included in our overall nonlabor price index comprise only 29.45 percent of the PPS nonlabor market basket. Therefore, with many items omitted, our overall nonlabor price index may not be an accurate representation of the nonlabor price differences across areas. In addition, all of the data are proxies from sources other than hospitals and may not be representative of the prices faced by hospitals. Clearly, better data need to be developed before a nonlabor input price index suitable for use in the PPS

TABLE 2-7

REGRESSIONS OF NONLABOR INPUT PRICES ON THE 1988 PPS WAGE INDEX[a]

Nonlabor Input Price	N	Adj R^2	Intercept	Slope
Malpractice Insurance	43	0.08*	-0.14	1.05
Commercial Energy (DOE)	51	-0.01	0.78	0.15
Residential Energy (DOE)	51	-0.02	0.99	-0.02
Commercial Telephone (FCC)	87	0.06*	1.48	-0.45
Retail Food (ACCRA)	194	0.15*	0.80	0.21
Residential Telephone (ACCRA)	194	0.02*	1.28	-0.31
Residential Energy (ACCRA)	194	0.03*	0.70	0.28
Overall Nonlabor Index	304	0.09*	0.75	0.24

[a] Regression run on values indexed to a national average = 1.0.

*F-Value and t-statistic significant at 0.05 level.

Source: See Table 1.

will be feasible. Some improvements may be possible in the use of available data that might not require collecting data directly from hospitals. This section reviews several possibilities for collecting better data from non-hospital sources. The problems of a primary survey of hospitals are discussed in Chapter 6.

This section covers two types of data acquisition. The first is obtaining better secondary data and the second is primary surveys of distributors and state agencies. Note, however, in neither case does it seem worthwhile to obtain better food price data than ACCRA's - there are too many problems (e.g., complexity and number of distributors to contact). Our review of obtaining new nonlabor input price data from nonhospital sources indicates, with the possible exceptions of telephone rates and hospital malpractice insurance premiums, that these data collection efforts would probably not result in the acquisition of data higher in quality than has already been located.

2.5.1 Better Secondary Data

Several of the sources from which we obtained secondary data indicated that better secondary data could be obtained. We review these possibilities here.

Telephone Rates

For telephone service costs, the multi/line business rate should be used in place of the single line rate. As mentioned before, many hospitals will need more than one line and therefore telephone service costs will be better measured using a multi/line rates. Information on how toll areas are defined and how large a percentage of total cost (on average) of the bill they comprised could improve the price analysis.

Without Congressional authorization, the FCC cannot compel phone companies to provide rate information on more areas than they already provide. One possibility for obtaining better data would be to have the FCC "lend" an experienced GS14-level analyst to HCFA for two months to collect data similar to what the FCC collects, but for more areas. (If HCFA were to borrow an FCC analyst to conduct a survey, the survey would be a primary survey.)

Energy Prices

The Department of Energy (DOE) conducts a survey of commercial and industrial buildings to obtain energy indexes. Currently the survey covers 6,000 buildings. It is not known whether the energy prices faced by hospitals are similar, geographically or otherwise, with DOE's energy indexes. Also, according to DOE, the current survey only provides enough accuracy for the nine census divisions. With such large areas, it is likely that there is considerable intra-area price variation which would not be acceptable to HCFA. The current DOE building survey, however, costs several million dollars. To expand it to obtain better data could easily increase the cost of the survey, according to DOE, to more than 10 million dollars - an absurd amount for one hospital input item. It therefore does not seem reasonable to rely on DOE for higher quality energy price data.

Malpractice Insurance Premiums

Malpractice insurance price information may be improved if information at a MSA/state non/metro level is available. St. Paul Fire and Marine Insurance Company reports malpractice insurance rates for several major metropolitan areas. These rates differ significantly from the state average rate. For example, the rate given for Detroit is $6,878 compared to $3,071 for Michigan as a whole. St. Paul has indicated that, through a special request, malpractice insurance prices at the MSA/state non/metro level could be provided. Note, however, the discussion in section 2.2 of the shortcomings of St. Paul data. The A.M. Best Company produces reports on the medical malpractice insurance market. Its data, however, is aggregated to the entire health industry and separate data for hospital malpractice premiums is not available.

Medical Supplies and Pharmaceuticals

Shortcomings of the IMS data were discussed in section 2.3. However, additional exploration of IMS data may be worthwhile to determine whether IMS data would be useful as a data source. Since the IMS data are so expensive, it would be advisable to obtain some relatively inexpensive geographic price tabulations of IMS data for a few representative input categories to judge the usefulness of the data. Also, direct conversations with IMS statisticians would be desirable before any substantial resources were devoted to obtaining IMS data.

2.5.2 Surveys of Distributors and State Agencies

Alternatives to obtaining price data from secondary sources includes surveys of suppliers and state regulatory agencies. This section reviews the possibility of obtaining price data from suppliers and state agencies.

Distributors and Manufacturers

A survey of manufacturers and distributors of medical supplies and pharmaceuticals is appealing in that these firms, if they were so inclined, could readily produce standardized input price data. There are, however, many significant obstacles in conducting the survey and obtaining the cooperation of the firms. First, there are few national distributors, therefore the leading two or three distributors in each area would need to be identified. This is a non-trivial task since much less known about this industry than the hospital industry. Additionally, hospitals often buy directly from manufacturers. Therefore, the leading manufacturers (e.g., Baxter Healthcare) that sell directly to hospitals would also have to be identified. Second, it is quite unlikely that the degree of cooperation of distributors and manufacturers would be high. Discussions with their representatives reveal that they regard their pricing policies as proprietary and thus would not usually cooperate. Third, even if supplier firms agreed to participate in a survey, the degree of cooperation might be quite superficial. That is, the firms only might provide list prices rather than transaction prices. Fourth, the design of the survey would be a substantial effort (see Chapter 6). It seems quite unlikely, therefore, that a survey of distributors and manufacturers of medical supplies and pharmaceuticals would result in obtaining better data than, say, from a primary survey of hospitals.

State Agencies

At the state level, public utility agencies and state insurance commissioners would likely be the only good sources of nonlabor input prices. Because of their regulatory status and the fact of their authority over rates, a survey of state utility commissions might be able to provide the energy prices charged to the commercial sector for each MSA within its state and for its rural area. The state utility commissions may also have total expenditure data as well which could provide the basis for quantity adjustments. However, not all types of energy are regulated by state agencies. Fuel oil for heating is not usually regulated at the state level. Water and sewer also are rarely regulated by states since local government usually provides these services. Thus, while surveying utility commissions would be less burdensome to HCFA than surveying hospitals, it would also be less comprehensive.

A survey of state insurance commissioners or major insurance companies may be able to provide the necessary malpractice premium information. Regulation of insurance companies was regulated to states by the McCarren Act (1944). States often have an insurance commissioner who has executive authority to approve insurance premium rate increases. Thus, it would seem that state insurance commissioners might have premium data.

The Urban Institute contacted state insurance commissioners as part of a project to determine the geographic variability of physician malpractice insurance premiums. State insurance commissioners did not provide premium information to the Urban Institute, instead, they provided the names of the leading physician malpractice companies in their states. The insurance companies cooperated with the Urban Institute in providing premium data.

One reason insurance commissioners did not provide the Urban Institute with premium data might have been because of the large number of companies underwriting physician malpractice insurance in each state. With fewer hospitals in each state and, presumably, fewer insurance companies underwriting hospital malpractice insurance, insurance commissioners might be able to provide hospital malpractice premium information. Even if they don't, they may provide, as they did for the Urban Institute, the names of the leading hospital malpractice insurers in their state. The experience of the Urban Institute indicates that contacting insurance companies for premium information might be feasible. Note, however, when the Urban Institute contacted insurance companies a second time to update premium information, the insurance companies started complaining about burden of providing the data.

3.0 MEASURING NONLABOR AND LABOR COSTS FROM SECONDARY HOSPITAL DATA

The lack of suitable data measuring geographic variation in the prices hospitals pay for nonlabor inputs suggests analyzing proxy measures such as hospital expenditures. However, it should be kept in mind that expenditures are an imperfect proxy for prices. The basic problem in using expenditure data to proxy geographic price variation is that expenditures are the product of unit price times the quantity (volume) of inputs purchased. Geographic variation in expenditures, therefore, may not be due to unit price variation, but rather input variation based on style of practice differences or other nonprice reasons. Additionally, if hospitals purchase inputs within the price-elastic range of their input demand curves, lower input prices would be accompanied by higher expenditures on the input, creating a negative correlation between prices and expenditures.

Chapters 4 and 5 present the results of analyses based on hospital expenditure data. This chapter describes the sources of hospital expenditure data on nonlabor inputs, the construction of analytic nonlabor (and labor) cost variables, their deficiencies, and the source and construction of other variables used in the analysis of the expenditure data. Finally, an overall evaluation of the ability of the Medicare Cost Report to provide accurate estimates of nonlabor costs is presented.

3.1 Hospital Data Sources

The two primary sources of hospital expenditure data on nonlabor and labor inputs are Medicare Cost Reports (MCRs) for 1989 and the American Hospital Association's (AHA) 1989 Annual Survey of Hospitals. Additional hospital level data came from HCFA's Impact File (see Section 3.4). For each hospital, data from these three sources were merged to form an analytic file.

3.1.1 Medicare Cost Reports (HCRIS Minimum Data Set)

Medicare Cost Reports are filed by hospitals as part of the process of determining the appropriate level of reimbursement for providing services to Medicare beneficiaries. With the advent of Medicare's Prospective Payment System (PPS), Medicare no longer reimburses the majority of hospital costs on the basis of Medicare allowable costs. There are costs, however, that continued to be reimbursed on a cost basis after PPS was implemented in October 1983. For this reason, it is important to hospitals that most, if not all, of the data elements on its MCR are accurate.

Data from Medicare Cost Reports are typically available from HCFA through the Hospital Cost Report Information System's (HCRIS) Minimum Data Set (MDS). As implied by its name, the HCRIS MDS does not contain each and every data element on the MCR. Much of the data that is provided in the HCRIS MDS is the result of aggregation over many cost centers. In many instances, the use of aggregated values does not permit precise construction of analytic variables, including those constructed for this study (see Section 3.2.1).

MCR data for fiscal year 1989 (PPS period 6) were utilized for the base analytic file. Initially the analytic file consisted of 5,409 non-federal, PPS non-exempt hospitals. Hospitals whose MCRs covered less than 10 months or more than 14 months were dropped from subsequent analysis. The reason is that these hospitals are typically involved in a sale. HCFA's (unpublished) analyses of such cases indicates disproportionately high capital costs, which in turn, can be attributed directly to accounting changes following the sale. Such high capital costs distorts cost shares of the other components of total costs: labor expenses and other nonlabor expenses. Of the 5,409 hospitals in our base file, 140 had MCRs that covered less than 10 months (none exceeded 13 months).

There were 115 hospitals whose total reimbursable (F138) costs before allocation (stepdown) was not equal to total reimbursable costs after stepdown (F263) and were thus dropped from subsequent analyses.[1] Both variables come from line 103 of, respectively, columns 0 and 27 on Worksheet B, Part I and are the results of hospital entries rather than HCFA calculations. The principal reason the two may not be equal is that some hospitals do some of their adjustments on Worksheet B (Part I) instead of on Worksheet A.

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[1] The "F" variables are the HCFA-assigned variable names on the fiscal year 1989 (PPS 6) HCRIS MDS. See Appendix B for a copy of Worksheets A and B, Part I with the HCRIS variable names placed in the appropriate cell(s).

There were ten hospitals that reported zero total facility costs. These hospitals were also dropped from all analyses. The total number of hospitals affected by these three conditions was 260 - leaving a total of 5,149 hospitals available for subsequent analysis.

3.1.2 American Hospital Association Annual Survey

Each year the AHA conducts a general survey of all hospitals, including federal and military hospitals. Information is requested about costs, hospital size (beds), facilities and services, workforce composition, and certification. HCFA's Office of the Actuary (OACT) uses information from the AHA Annual Survey to help determine the labor and nonlabor shares of costs (Freeland, Anderson, and Schendler, 1979). OACT's methodology, even though developed prior to PPS, is used to help determine labor and nonlabor shares under PPS.

Unlike Medicare Cost Reports, response to the AHA's Annual Survey is strictly voluntary. This raises the possibility that responses for individual items on the survey may not be as accurate as on Medicare Cost Reports. The AHA's survey usually requests less detailed information on costs and charges than the Medicare Cost Report. Additionally, some of the requested items on the AHA survey have different definitions than their MCR counterparts. On the other hand, the AHA survey requests more detailed information than the Medicare Cost Report about specialized facilities and services and workforce composition.

AHA records were found for 5,079 of the 5,149 hospitals in the base file. However, due to item non-response and outlier trims (see Section 3.3), there is a maximum of 4,675 hospitals with usable analytic (labor and nonlabor costs) variables created from AHA data.

3.2 Construction of Analytic Variables

3.2.1 Nonlabor and Labor Cost Variables from Medicare Cost Report Data

Total nonlabor and labor costs for hospital inpatient services can neither be precisely nor directly obtained from Medicare Cost Reports (MCRs). This section describes how estimates of both nonlabor and labor costs from MCRs were derived. Before doing so, however, the basic difficulties in deriving accurate estimates of nonlabor and labor costs are discussed. Next, the actual estimation methodology employed in this report is described. Finally, assuming all MCR data are available (rather than just HCRIS abstracts),[2] modifications to the estimation methodology employed in this study are briefly discussed.

3.2.1.1 Difficulties in Deriving Labor/Nonlabor Cost Estimates from MCRs

Except for Worksheet A, labor and nonlabor costs are not reported separately in the Medicare Cost Report. The first two columns of Worksheet A are labeled, respectively, "salaries" and "other." The estimates of labor and nonlabor hospital inpatient costs rely, respectively, on these two columns. These two columns are added together to obtain column 3 of Worksheet A; thereafter, separate labor and nonlabor costs are no longer identifiable in the Medicare Cost Report. The rows of Worksheet A indicate the "cost center" in which expenses were incurred. Since hospital inpatient costs are the object of this study, only costs from rows 25-30 (inpatient routine service cost centers) and rows 37-59 (ancillary service cost centers) are required.

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[2] The standard HCRIS MDS was available to us. Additional data elements from the Medicare Cost Report can be obtained from HCFA upon request. (We had a special abstraction for one line.) However, even if additional data elements from the cost report worksheets were available, a precise estimate of nonlabor and labor costs probably would still not be possible for many, if not most, hospitals.

Effective October 1, 1993, HCFA uses MCR Worksheet S-3 Part II to construct the PPS area wage index. Comments in this report pertaining to the adequacy of labor related data in HCRIS MDS pertain only to data from Worksheet A, not Worksheet S-3 Part II, which was not available for the time period covered by this report. The availability of data from Worksheet S-3 Part II would not affect the results in this report because it would not help with the problems we encountered subtracting out non-labor related costs in Worksheet A.

In addition to valid nonlabor costs,[3] the "other" column also includes capital-related costs, medical education costs reimbursed through separate adjustments to the DRG payment, and labor-related costs such as employee benefits. Inappropriate costs in the "other" column, therefore, need to be eliminated in order to obtain valid estimates of nonlabor costs. There are, however, several complications in eliminating such inappropriate costs. First, because the rows of Worksheet A, as well as many of the other worksheets in the MCR, are for cost centers rather than types of costs, it is possible that labor-related and capital-related costs (other than those described above) may be included in the "other" column entries (e.g., contract labor and professional fees paid to lawyers, accountants, etc.). Second, some costs need to be reclassified from one cost center to other cost centers. This is accomplished through column 4 (reclassifications) of Worksheet A. Third, some costs are not allowable (eligible) for Medicare reimbursement.[4] These costs need to be subtracted from the sum of columns 1 and 2 of Worksheet A. Conversely, some allowable costs, such as home office expenses for hospitals belonging to a hospital system, need to be added to the appropriate cost center. The subtraction of unallowable costs and the addition of allowable costs incurred elsewhere are performed in column 6 (adjustments) of Worksheet A. Fourth, some of the costs in the general service cost centers (rows 1-24) need to be allocated (stepped-down) to other cost centers, including hospital inpatient cost centers. This allocation, however, is supposed to be performed in Worksheet B (Part I) rather than on Worksheet A.

Detailed information on reclassifications and adjustments, respectively, is supposed to be provided in Worksheets A-6 and A-8. The row titles for Worksheet A-8, however, are not always specific enough to distinguish between labor and nonlabor costs. The rows on

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[3] Prior to fiscal year 1992, capital-related costs were reimbursed on a "pass-through" basis. As such, capital-related costs were not included in the definition of the nonlabor portion of costs used to define the PPS market basket.

[4] Disallowed costs often include capital costs and physician compensation (particularly at university medical center hospitals). Recently, there has been an increase in the "redistribution" of costs from, say, a state university to a hospital; cost redistributions are also disallowed.

Worksheet A-6 do not include titles, which makes it difficult to computerize the types of reclassifications, let alone determine whether they are labor- or nonlabor-related. The lack of consistently appropriate detail in Worksheets A-6 and A-8 makes it impossible for us to develop truly accurate measures of labor and nonlabor costs for many of the 5,149 hospitals in our data set. Therefore, the best that can be done is to estimate labor and nonlabor costs.

3.2.1.2 Method Used to Estimate Nonlabor and Labor Costs

Since the primary focus of this study is on nonlabor costs, the methodology used to estimate nonlabor costs is described in more detail than the methodology used for labor costs. Also, estimation of nonlabor costs was more complicated than that of labor costs. Since labor and nonlabor costs are only presented separately in columns 1 and 2 of Worksheet A, values in these columns need to be adjusted to take into account the reclassification, adjustments, and allocation described above. Column 2 also needs to be purged of inappropriate items such as capital and employee benefit costs.

The estimation methodology for both labor and nonlabor costs involves two types of factors: (1) a scaling factor which takes into account the reclassifications and adjustments in columns 4 and 6, respectively, on Worksheet A in going from column 3 to column 7 and (2) an allocation factor that takes into account the allocation of general costs (rows 1-24) in going from column 7 of Worksheet A (same as column 0 of Part I of Worksheet B) to column 27 of Worksheet B (Part I).

Scaling is performed to reflect the reduction or increase of total costs (column 3) as costs are reclassified (column 4) and/or adjusted (column 6) in order to obtain column 7 of Worksheet A. As noted above, the HCRIS MDS does not provide data for each row (cost center) of each column of Worksheet A; rather, for each column, rows are often summed to provide an aggregate value.

For instance, salaries assigned[5] to the general services cost centers (column 1, rows 3-24) are aggregated to a single value, F92. Three scaling factors were utilized to adjust values in columns 1 and 2:

$$\alpha = F129 / (F92 + F102),$$
$$\beta_1 = F130 / (F94 + F104), \text{ and}$$
$$\beta_2 = F132 / (F96 + F106).$$

If aggregate general service costs after reclassification and adjustment (F129) is less than before reclassification and adjustment (F92+F102), then multiplication of each F92 and F102 by α will proportionally reduce their individual values (see Exhibit 3-1 for variable definitions). Similarly, if F129 is greater than the sum of F92 and F102, then each will be increased proportionally by α. β_1 and β_2, respectively, are used to scale costs (labor plus nonlabor) in inpatient routine cost centers and ancillary cost centers.

The allocation of costs from general service cost centers to the other cost centers is performed on Part I of Worksheet B. The shares of F129 allocated to routine and ancillary centers are calculated, respectively, as follows:

$$\gamma_1 = ([F222 + F223 + F224 + F225] - F130) / F129$$
$$\gamma_2 = ([(F231 + \ldots + F254) - 2(F244 + F246)] - F132) / F129.$$

If a hospital has outpatient and other facilities, γ_1 plus γ_2 will be less than one.[6] Aggregate general service salaries (F92) and "other" costs (F102) are then multiplied by the γs to arrive

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[5] One purpose of the Medicare Cost Report is to allocate costs to the appropriate cost center. Many hospitals do not record actual costs incurred for each cost center. Rather, they "assign" costs to a category for *ex post* reclassification and allocation.

[6] In calculating γ_2, F244 and F246 need to be removed from the aggregation. For the purposes of determining allowable ancillary costs, F244 and F246 should not be included since they are for Medicare reimbursement limit adjustments for, respectively, the respiratory therapy and physical therapy departments. Further, F244 and F246 do not represent actual cells in column 27 of Worksheet B, Part I. Rather, they are the results of calculations performed retrospectively by HCFA.

EXHIBIT 3-1

DENOTATION OF HCRIS VARIABLES

	Source (Worksheet and Column)			
Cost Center	Wskt. A, Col. 1	Wskt. A, Col. 2	Wskt. B, Part I, Col. 0*	Wskt. B, Part I, Col. 27
General Service (rows 1-24)	F92	F102	F129	-
Capital Related Costs -- Buildings and Fixtures (row 1)	-	F90	-	-
Capital Related Costs -- Movable Equipment (row 2)	-	F91	-	-
Intern-Resident Other Program Costs (row 22)	-	F103	-	-
Inpatient Routine (rows 25-30)	F94	F104	F130	F222 through F225
Ancillary (rows 37-59)	F96	F106	F132	F231 through F254**

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*The same values are in column 7 of Worksheet A.

**For the purposes of determining allowable ancillary costs, F244 and F246 should not be included since they are for Medicare reimbursement limit adjustments for, respectively, the respiratory therapy and physical therapy departments. Further, F244 and F246 do not represent actual cells in column 27 of Worksheet B, Part I. Rather, they are the results of calculations performed retrospectively by HCFA.

at initial estimates of labor and nonlabor costs. Including the elimination of inappropriate cost items, nonlabor costs for routine and ancillary centers are then calculated as follows:

$$NLC = \beta_1 F104 + \beta_2 F106 - \gamma F181 + \alpha\gamma(F102 - F90 - F91 - F103 - BENEFITS)$$

where γ is equal to γ_1 plus γ_2;[7] F181 is the aggregate directly-assigned capital costs for general cost centers, inpatient routine cost centers, and ancillary cost centers (lines 3-33 plus 37-59, column 0, Worksheet B, Part II); F90 is capital-related costs for buildings and fixtures (line 1, column 2, Worksheet A); F91 is capital-related costs for movable equipment (line 2, column 2, Worksheet A); F103 is intern and resident service costs (line 22, column 2, Worksheet A); and BENEFITS is employee [fringe] benefits (a special data extract provided by HCFA corresponding to line 3, column 2, Worksheet A). Capital-related costs - F90, F91, and F181 - had to be subtracted from the aggregate "other" general service costs, F102, because capital-related costs are not a component of PPS-defined nonlabor costs. Intern and resident service costs are reimbursed separately under PPS and thus were subtracted from F102. Finally, employee fringe benefits are clearly labor-related and thus need to subtracted from F102.

Labor-related costs are calculated as follows:

$$LC = \beta_1 F94 + \beta_2 F96 + \alpha\gamma(F92 + BENEFITS - F93)$$

where F93 is the salaries of interns and residents. As was the case for nonlabor costs, intern and resident costs were taken out because of separate reimbursement under PPS.

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[7] The mean values for the scaling and allocations factors are as follows: α is .95, β_1 is 1.04, β_2 is 1.04, and γ is .818.

The methodology employed reflects the data available from the HCRIS minimum data set. As such, there are some implicit assumptions that can not be avoided. For instance, the formulas for α, βs, and γs implicitly assume the same proportional modifications to labor and nonlabor costs. Since many disallowances (column 6 of Worksheet A) are likely to involve capital-related costs, the values of α and the βs are probably too high for nonlabor costs and too low for labor costs. In such cases, then, the labor cost estimates are too low and the nonlabor cost estimates are too high. The use of γ to adjust directly-assigned capital costs before subtracting them from "other" costs is also problematic. The calculation of γ did not take directly-assigned capital costs into consideration. However, γ is probably the best adjustment factor for directly-assigned capital costs available. Given how γ is calculated, the amount of directly-assigned capital costs subtracted from "other" costs is probably too low which then results in an over-estimate of nonlabor costs.

3.2.1.3 Refinements to Method of Estimating Labor/Nonlabor Costs

Finally, we briefly describe modifications to the cost estimation methodology employed in this report that would be desirable if all of the data elements on the Medicare Cost Report were available. At a minimum, an estimate could be derived which would result in all directly-assigned capital costs being eliminated from the estimate of nonlabor costs.

Additionally, verified contract labor expenses could be subtracted from nonlabor costs and added to labor costs. Although such a variable is supposedly available on the HCRIS MDS (W4), there were only 23 hospitals with non-zero values. This low response rate is clearly incorrect. As noted by HCFA with regard to responses to the HCFA survey of 1988 hospital wages (Federal Register 55:171, September 4, 1990, p. 36036), 50 percent of hospitals reported contract worker services.[8] Thus the quality of the contract labor expense data available on the HCRIS MDS is poorer than that collected by HCFA for the PPS wage index.

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[8] Other data quality problems, however, led HCFA to omit data on contract workers in constructing the hospital wage index for fiscal year 1991 (Federal Register 55:171, September 4, 1990).

3.2.2 Nonlabor and Labor Cost Variables from AHA Annual Survey Data

Nonlabor and labor cost analytic variables were also created from AHA data elements. Costs incurred in the long-term (nursing-home) units of hospitals were not included in the cost measures. Nonlabor costs are based on the AHA variable "all other operating expenses" (NPAYOTHOPH) while labor costs are based on the sum of "payroll expenses for all other personnel" (PAYOTHH86), "employee benefits" (NPAYBENH), and "professional fees" (NPAYFEEH).[9] Costs incurred in outpatient departments were factored-out by multiplying both of the preceding aggregates by the ratio of hospital inpatient days (IPDH) to "adjusted patient days" (ADJPD) to arrive at hospital inpatient nonlabor and labor costs.

As is true of cost variables constructed from MCR data, there are problems with the cost variables constructed from AHA data. In particular, the "all other operating expenses" category that is used for the basis of the AHA version of nonlabor costs includes certain labor-related and capital costs. Potentially incurred labor-related costs are mostly contract labor expenses. Since there are separate line items for depreciation and interest expenses, capital costs that might be included in NPAYOTHOPH consist of leases and rentals, insurance, return on equity, costs of minor equipment, and taxes on land and depreciable assets.[10] (OACT uses an "input-output" matrix constructed by the Bureau of Economic Analysis [U.S. Department of Commerce] to eliminate labor-related and capital costs from the "all other expense" category. OACT apparently uses the matrix on national aggregates; thus, even if the matrix were available to us, it would not be useful in measuring hospital-specific nonlabor costs.)

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[9] Variable names in parentheses are from the AHA's tape-layout documentation for the 1989 Annual Survey.

[10] Prospective Payment Assessment Commission. Technical Appendixes to the Report and Recommendations to the Secretary, U.S. Department of Health and Human Services, April 1, 1986.

The AHA does not use consistent definitions for the "all other operating expenses" category. In particular, nonoperating expenses ("expenses not directly related to patient care or hospital-related patient services") are often included in "all other operating expenses." For instance, prior to the 1988 survey, nonoperating expenses were included in "all other operating expenses." Further, in the 1987 survey, a definition of nonoperating expenses was not included. In the 1988 and 1989 surveys, nonoperating expenses were requested separately from "all other operating expenses." In the accompanying instructions to 1988 and 1989 surveys, hospitals were instructed to include federal and state income taxes. In 1990, however, the two expense categories were once again combined. Income taxes and operating losses were included in the 1990 definition of "all other operating expenses."

3.2.3 Comparison of MCR- and AHA-Based Cost Measures

As noted in the preceding sections, the data underlying the estimates of nonlabor costs from both MCRs and AHA data are imperfect. Part of the problem is that underlying data from both sources are, in essence, residual categories. Indeed, the only clearly defined category in either dataset is employee gross wages and salaries. MCR nonlabor data is contaminated by directly-assigned capital costs, contract labor expenses, and professional fees. AHA data is contaminated by capital costs (other than depreciation and interest), contract labor expenses, nonoperating expenses unrelated to patient services (depending on the survey year), and, for proprietary hospitals, federal and state income taxes.

Both the MCR and AHA data had to be adjusted to estimate hospital inpatient nonlabor costs. The AHA data was subjected to a simple but not necessarily effective adjustment for outpatient costs. The modifications for (1) reclassification and adjustments and (2) allocation of overhead costs on the MCR data were extensive but not necessarily more effective than the AHA adjustments.

The AHA data has more identified contaminants than the MCR data. On the other hand, adjustments to the MCR data were more extensive than those to AHA data. On an a priori basis, then, there does not seem to be any compelling reason to prefer one data source over the other. In Section 3.4, a brief evaluation of the MCR worksheets as a data collection instrument is presented. In Chapter 4, the validity of the actual estimates of nonlabor costs based on MCR and AHA data is discussed.

3.3 Standardization of Analytic Variables

In order to compare hospital costs, they must be standardized for hospital output (size). Because PPS pays hospitals on a per case basis, hospital inpatient nonlabor and labor costs were standardized by dividing by inpatient discharges.[11] MCR measures of nonlabor (NLC) and labor (LC) costs were divided by hospital inpatient discharges, F88.[12] AHA measures of hospital inpatient nonlabor and labor costs were divided by the AHA's hospital inpatient discharges (DCH). In addition, the nonlabor share of total costs was created by dividing nonlabor costs by total hospital inpatient costs. Total hospital inpatient costs is equal to the sum of hospital inpatient nonlabor and labor costs.

To calculate Medicare nonlabor and labor costs, Medicare share variables were first calculated. For the MCR measures, the Medicare share variable was calculated by dividing total Medicare hospital costs (including outpatient) by total hospital costs (including outpatient).[13]

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[11] Other variants were developed by dividing by costs per discharge by the PPS cost-based case mix index and by the PPS wage index (using geographical areas in which hospitals are located rather than the payment areas to which hospitals were assigned) based on HCFA's survey of 1988 hospital wage data.

[12] Starting with the 1989 (PPS-6) Medicare Cost Reports, Worksheet S-3 was altered so that swing-bed discharges could be excluded from the count of total hospital inpatient discharges. This resulted in a new HCRIS variable F88C: Total Discharges--Hospital Total (Excluding Swing Bed SNF and Swing Bed ICF). Examination of F88C and its Medicare discharge counterparet, F82B, revealed unacceptably high counts of negative and zero values (1,365 for F88C and 1,372 for F82B) for these variables.

[13] Ideally, two Medicare share variables would have been created, one for routine inpatient costs and the other for ancillary costs. However, because problems in trying to calculate separate directly-assigned capital costs for routine inpatient costs and ancillary costs, separate nonlabor and labor costs for inpatient routine and ancillary costs could not be calculated. Thus a simpler algorithm was used to calculate the Medicare share variable from the Medicare Cost Report.

Because the AHA Annual Survey does not request Medicare cost data, for the AHA cost measures, Medicare's share was calculated by dividing Medicare hospital inpatient days by total hospital inpatient days. MCR and AHA nonlabor and labor costs were then multiplied by their respective Medicare share variables to determine their Medicare counterparts. For the MCR measures, Medicare nonlabor and labor costs were then divided by Medicare hospital inpatient discharges, F82, while for the AHA measures, they were divided by Medicare hospital inpatient discharges, MCRDCH.

After reviewing the distributions of nonlabor and labor MCR costs per discharge, data edits were adopted. For any hospital whose MCR costs per discharge (regardless of whether nonlabor or labor or whether based on all hospital inpatients or just Medicare hospital inpatients) was less than $100 per discharge or greater than $10,000 per discharge, all of its MCR cost measures were set to missing. A similar rule was applied to the AHA cost measures, which were set to missing when an AHA cost per discharge failed the data edit screens. The MCR data edits mostly affected high MCR costs per discharge while the AHA data edits mostly affected low AHA costs per discharge. Because of the way the Medicare share variables were constructed, the nonlabor share of Medicare costs is the same as the nonlabor share of total costs for both of the MCR and AHA versions.

3.4 Other Variables

HCFA's Impact File was the source of PPS payment variables such as sole community hospital status, disproportionate share status, indirect medical education adjustments, and Medicare DRG case mix. A version (from fall 1990) of the PPS hospital wage index based on the HCFA survey of 1988 hospital wages was used. The 1989 AHA Annual Survey was also the source of discharge data, binary variables indicating on-site availability of facilities and services, and other case mix variables. Poor item response limited the use of some of the AHA case mix variables (e.g., the cardiac ICU share of inpatient days). HRSA's Area Resource File was the source of county population, per capita income, land area, and seasonal temperatures. Prices on specific nonlabor categories came from a variety of public and private sources (see Chapter 2).

3.5 Ability of Medicare Cost Reports to Measure Nonlabor Costs

Section 3.2.3 discussed some of the problems with the source of nonlabor costs (the "other" column in Worksheet A) on Medicare Cost Reports. Given the current MCR design, with correctly entered data elements in the MCRs for directly-assigned capital costs and contract labor expenses, it is conceptually possible to eliminate these costs that are included in nonlabor costs. The current design, however, does not facilitate the removal of professional fees. Further, given the residual status of the "other" column, there is an unknown amount of other inappropriate costs. Finally, the scaling and allocation factors that take into account reclassifications (Worksheet A, column 4) adjustments (Worksheet A, column 6), and allocation of general costs (Worksheet B, Part I) are, at best, reasonable but not necessarily precise modifications.

Criticism of Medicare Cost Reports as the basis of measuring actual costs is not new (ProPAC, 1988). In order for the Medicare Cost Report to be a reliable source for nonlabor costs, several alterations are necessary. One alteration would allow for separate columns for salary and "other" costs after reclassification (column 4) and adjustments (column 6) on Worksheet A. An even greater improvement would be the substitution of several columns representing different categories of cost for the "other" column and continuation of these columns after reclassification and adjustment on Worksheet A. Finally, more uniform accounting standards for MCRs would have to be promulgated and enforced (ProPAC, 1988).

4.0 DESCRIPTIVE ANALYSIS OF NONLABOR AND LABOR COST PER DISCHARGE

This chapter presents a descriptive analysis of variations in hospital nonlabor cost per discharge. Frequent comparisons to variations in labor cost per discharge are made. In the following section, the distributions of nonlabor and labor costs per discharge are described and analyzed. In the second section, the distributions of nonlabor and labor cost per case-mix adjusted discharges and wage index adjusted discharge are discussed and compared to the unadjusted distributions. Section three analyzes mean costs by hospital attributes while section four summarizes the results and evaluates the differences between MCR and AHA measures of cost variables.

4.1 Distribution of Costs per Discharge

The distributions of total nonlabor cost per discharge, Medicare nonlabor cost per discharge, nonlabor share of total costs, total labor costs per discharge, and Medicare labor costs per discharge derived from both MCR and AHA data are presented in Table 4-1. In addition to the quantiles of the distributions, the weighted[1] means, standard deviations, and coefficients of variation[2] are presented.

Mean total nonlabor cost per discharge in 1989 (PPS 6) was $1,915 while median nonlabor cost was $1,536 (MCR data). Mean total labor cost per discharge in 1989 was $2,458 while median labor cost was $1,990. While the ranges of the two distributions were approximately the same, nonlabor costs vary more: the CV for the nonlabor cost distribution was 44 percent compared to labor's 37 percent. PPS labor payments are geographically adjusted by the area wage index. The greater variation of nonlabor costs suggests that the prices of nonlabor inputs are not geographically uniform and that a PPS payment adjustment for nonlabor costs may be needed. However, it is also possible that the variation of nonlabor costs is primarily due to variations in input quantities.

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[1] See the footnotes to Table 4-1 for the weights used for each cost measure.

[2] The coefficient of variation (CV) is equal to 100 times the quotient of the standard deviation divided by the mean. The CV is a standardized measure of the variability of a distribution.

TABLE 4-1

DISTRIBUTION OF NONLABOR AND LABOR COST PER DISCHARGE AND NONLABOR SHARE OF COSTS, 1989

	COST PER DISCHARGE				MEDICARE COST PER MEDICARE DISCHARGE				NONLABOR SHARE OF TOTAL COSTS	
	MCR[a,c]		AHA[b,d]		MCR[e]		AHA[f]			
Quantiles	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor	MCR	AHA
99	$5,174	$5,853	$3,252	$5,449	$5,695	$6,465	$4,117	$6,937	62.5%	52.1%
95	3,472	3,838	2,301	3,885	3,988	4,773	2,962	5,086	57.4	46.0
90	2,795	3,263	1,907	3,281	3,354	4,109	2,530	4,378	54.3	42.9
75	2,072	2,552	1,422	2,541	2,580	3,223	1,887	3,326	49.4	40.0
50 (Median)	1,536	1,990	1,036	1,888	1,877	2,400	1,356	2,444	43.9	35.2
25	1,191	1,562	752	1,430	1,368	1,748	910	1,721	39.0	31.8
10	956	1,241	556	1,085	1,045	1,340	616	1,193	34.9	28.0
5	842	1,094	415	832	892	1,160	412	829	32.8	25.6
1	651	838	151	317	647	875	166	349	28.8	20.8
Mean (weighted)	1,915	2,458	1,420	2,533	2,428	3,138	1,826	3,251	43.4	35.8
Standard Deviation	850	901	627	1,011	1,006	1,182	800	1,325	7.3	6.1
Coefficient of Variation	44	37	44	40	41	38	44	41	16.9	17.1
Number of Observations	5,025	5,025	4,675	4,675	5,025	5,025	4,675	4,675	5,025	4,675

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

[c] Weight = Total hospital inpatient discharges (F88) from MCR data.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data.

[e] Weight = Medicare hospital inpatient discharges (F82) from MCR data.

[f] Weight = Medicare hospital inpatient discharges (MCRDCH) from AHA data.

Source: 1989 Medicare Cost Reports and AHA *Annual Survey*.

The distribution of labor costs per discharge based on AHA data is similar to the one derived from MCR data while the nonlabor cost distributions are not similar. The means and medians of the labor cost per discharge derived from MCR and AHA data are about the same -- they differ only about three percent. The coefficient of variation of the two nonlabor cost distributions is identical, 44 percent. The same, however, is not true of the means and medians of nonlabor cost per discharge: the mean MCR nonlabor cost per discharge was 35 percent higher than the AHA value. This large difference in nonlabor cost per discharge is reflected in the nonlabor share of total costs with the MCR measure being 7.6 percentage points (21 percent) higher than the AHA measure.

Compared to nonlabor's share of the PPS market basket (29 percent), the means of both of the MCR and AHA nonlabor cost share variables are too high, with the AHA mean at 35.8 percent and the MCR mean at 43.4 percent. However, the data that underlies the PPS market basket is based on AHA data. Therefore the PPS market basket is not necessarily the standard upon which comparisons should be based. Further, as noted in the previous chapter, both MCR and AHA nonlabor data available for this study are contaminated with labor-related and capital costs that could not be eliminated from the estimates. Nonetheless, a nonlabor share of costs exceeding 40 percent seems unreasonably high (especially when capital costs are not included in total costs).

The relationship between MCR and AHA distributions of Medicare nonlabor and labor cost per discharge are the same as for total nonlabor and labor costs. That is, the mean of the MCR measure of nonlabor cost per discharge ($2,458) is 25 percent higher than the AHA measure ($1,826) while the labor cost measures only differ by 4 percent.

Table 4-2 shows the distributions of the ratio of MCR to AHA nonlabor and labor costs per discharge in each hospital. Ratios greater than 1.0 indicate that the MCR value is greater than the AHA value. At the individual hospital level, many of the ratios are quite large. For total nonlabor costs per discharge, the median ratio was 1.478 which indicates that the MCR value was 47.8 percent higher than the AHA value. The MCR value of total nonlabor cost per discharge exceeded the AHA value for at least 90 percent hospitals.

TABLE 4-2

DISTRIBUTION OF THE RATIOS OF MCR[a] TO AHA[b] MEASURES OF NONLABOR AND LABOR COSTS PER DISCHARGE, 1989

	TOTAL COST PER DISCHARGE			MEDICARE COST PER MEDICARE DISCHARGE	
Quantiles	Nonlabor	Labor	Nonlabor Share	Nonlabor	Labor
99	8.806	5.350	2.202	8.681	5.291
95	3.468	2.231	1.751	3.587	2.237
90	2.502	1.541	1.604	2.582	1.595
75	1.862	1.220	1.391	1.826	1.204
50 (Median)	1.478	1.039	1.218	1.417	0.998
25	1.234	0.902	1.094	1.164	0.845
10	1.054	0.774	1.013	0.982	0.713
5	0.951	0.701	0.960	0.874	0.628
1	0.720	0.519	0.841	0.641	0.447
Mean (unweighted)	1.815	1.219	1.276	1.761	1.185
Standard Deviation	1.530	0.967	0.313	1.483	0.915
Coefficient of Variation	84.272	79.333	24.534	84.177	77.168
Number of Observations	4,408	4,408	4,408	4,408	4,408

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

The median and mean ratios of MCR to AHA total labor costs per discharges are, respectively, 1.039 and 1.219; much lower than their nonlabor counterparts. Further, in contrast to over 90 percent of hospitals, only about 50 percent of the hospitals had a higher MCR total labor cost per discharge value than AHA value. The degree of variation of the two distributions of ratios, however, are similar: the CV for the nonlabor ratios was 84.3 percent while the CV for the labor ratios was 79.3 percent.

The distribution of MCR/AHA ratios for Medicare nonlabor and labor cost per discharge are similar to those for total nonlabor and labor costs. Hospitals whose MCR values exceeded their AHA values the most were small (both rural and urban), public, and non-teaching.[3]

4.2 Distribution of Costs per Adjusted Discharge

The distributions presented in Table 4-1 were not adjusted for factors such as case mix which may systematically affect costs. Two different variants of the cost measures were created to determine whether the variability of nonlabor values would be affected. One variation was to adjust discharges by the hospital's Medicare case mix index (Table 4-3) while the other variation was to adjust by the PPS wage index (Table 4-4).

The coefficients of variation for the nonlabor and labor cost per discharge distributions declined only by a five or six percentage points or 12-15 percent when adjusted for case mix. Adjusting by the PPS wage index resulted in slightly larger declines in the CV. With adjusted CVs in the 30-40 percent range, there is still substantial variation in both the nonlabor and labor cost per discharge distributions. Also, the nonlabor cost CVs are always greater than the

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[3] There were hospitals whose AHA values grossly exceeded their MCR values. However, it is random in that it does not appear that any hospital attributes are associated with the phenomenon.

TABLE 4-3

DISTRIBUTION OF NONLABOR AND LABOR COST PER CASE-MIX ADJUSTED DISCHARGE, 1989

	COST PER DISCHARGE				MEDICARE COST PER MEDICARE DISCHARGE			
	MCR[a,c]		AHA[b,d]		MCR[e]		AHA[f]	
Quantiles	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor
99	$5,845	$7,209	$3,360	$5,837	$6,007	$6,917	$4,074	$7,139
95	3,614	4,152	2,212	3,888	4,090	4,917	2,880	5,054
90	2,930	3,440	1,911	3,322	3,401	4,231	2,489	4,398
75	2,197	2,741	1,496	2,642	2,681	3,395	1,953	3,469
50 (Median)	1,729	2,215	1,165	2,102	2,101	2,667	1,503	2,689
25	1,398	1,830	901	1,699	1,651	2,101	1,100	2,073
10	1,174	1,530	689	1,357	1,323	1,708	774	1,497
5	1,047	1,373	509	1,036	1,163	1,487	526	1,058
1	841	1,085	185	408	863	1,191	207	434
Mean (weighted)	1,897	2443	1,384	2,488	2,415	3,129	1,791	3,212
Standard Deviation	722	789	507	859	821	1,008	654	1,131
Coefficient of Variation	38	32	37	35	34	32	37	35
Number of Observations	5,020	5,020	4,477	4,477	5,020	5,020	4,477	4,477

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

[c] Weight = Total hospital inpatient discharges (F88) from MCR data adjusted by casemix.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data adjusted by casemix.

[e] Weight = Medicare hospital inpatient discharges (F82) from MCR data adjusted by casemix.

[f] Weight = Medicare hospital inpatient discharges (MCRDCH) from AHA data adjusted by casemix.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

ABLE 4–4

ISTRIBUTION OF NONLABOR AND LABOR COST PER WAGE INDEX ADJUSTED DISCHARGE, 1989

	COST PER DISCHARGE				MEDICARE COST PER MEDICARE DISCHARGE			
	MCR[a,c]		AHA[b,d]		MCR[e]		AHA[f]	
Quantiles	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor	Nonlabor	Labor
99	$5,110	$5,912	$3,256	$5,034	$5,615	$6,092	$3,966	$6,396
95	3,424	3,797	2,235	3,672	3,879	4,470	2,905	4,721
90	2,838	3,199	1,908	3,124	3,351	3,966	2,471	4,144
75	2,169	2,653	1,459	2,556	2,649	3,270	1,919	3,362
50 (Median)	1,705	2,183	1,130	2,072	2,049	2,634	1,450	2,674
25	1,351	1,805	870	1,694	1,598	2,076	1,056	2,064
10	1,117	1,501	655	1,314	1,276	1,656	736	1,452
5	986	1,346	496	989	1,106	1,442	499	1,018
1	786	1,037	180	374	797	1,098	200	409
Mean (weighted)	1,928	2450	1,408	2,494	2,474	3,159	1,828	3,229
Standard Deviation	791	771	573	830	921	965	726	1,076
Coefficient of Variation	41	31	41	33	37	31	40	33
Number of Observations	5,025	5,025	4,483	4,483	5,025	5,025	4,483	4,483

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

[c] Weight = Total hospital inpatient discharges (F88) from MCR data adjusted by the PPS wage index.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data adjusted by the PPS wage index.

[e] Weight = Medicare hospital inpatient discharges (F82) from MCR data adjusted by the PPS wage index.

[f] Weight = Medicare hospital inpatient discharges (MCRDCH) from AHA data adjusted by the PPS wage index.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

labor cost CVs. Adjusting nonlabor and labor cost, thus, did not affect the conclusion of the preceding section that a geographic adjustment for nonlabor expenditures might be needed.

4.3 Mean Costs per Discharge by Hospital Characteristic

The distributions for nonlabor and labor cost per discharge, Tables 4-1 through 4-4, were not adjusted for individual hospital attributes nor geographic location. The unit prices hospitals pay for medical and other hospital supplies may vary due to geographic location and/or individual attributes such as bedsize and teaching status. For instance, large hospitals may be better able to negotiate volume discounts than small hospitals, especially if the shelf life of the product is short and/or storage costs exceed volume discounts. Pharmaceuticals is one example of where larger hospitals may be able to obtain greater volume discounts than smaller hospitals. Teaching hospitals may be given larger than average price discounts by pharmaceutical manufacturers as a reward for their role in the development and testing of new ethical drugs. Proprietary hospitals, which tend to have fewer beds than average and are less likely to be affiliated with a teaching hospital, may be expected to pay higher unit prices than voluntary or public hospitals. On the other hand, because of the necessity to earn an adequate profit, proprietary hospitals may have more incentive to obtain price discounts than voluntary or public hospitals. Rural hospitals, which are typically small, would be unlikely to obtain the volume-related price discounts that large urban hospitals might have. Also, rural hospitals may have to pay higher transportation prices for the supplies they purchase than urban hospitals. Similarly, hospitals in smaller urban areas may be expected to pay higher prices than hospitals in larger urban areas. Finally, if the price of supplies is positively correlated with the local cost of living, then prices of supplies should be higher in New England, Middle Atlantic (New York, New Jersey, and Pennsylvania), and the Pacific census divisions than in other census divisions.

The above comments regarding price variation include expectations based on individual hospital attributes as well as hospital geographic location. If the price expectations regarding hospital attributes are valid and are supported by the data, then they provide a standard by which geographic variation in nonlabor costs (expenditures) can be judged. Based on the foregoing discussion and assuming that variation in nonlabor expenditures is due solely to unit price variation, then some of the following patterns may be expected. First, nonlabor expenditures per discharge would decline as hospital size increased. Second, major teaching hospitals would have lower nonlabor expenditures per discharge than "other" teaching hospitals. "Other" teaching hospitals, in turn, would have lower nonlabor expenditures than non-teaching hospitals. Third, assuming bedsize and teaching status have more influence than ownership on a hospital's use of volume discounts, proprietary hospitals would have greater nonlabor expenditures per discharge than public or voluntary hospitals which on average are larger and more likely to be major teaching centers. Fourth, nonlabor expenditures per discharge will be higher in rural areas than in urban areas. Fifth, nonlabor expenditures per discharge will be higher in smaller urban areas than in larger urban areas. Sixth, nonlabor expenditures per discharge will be higher in the New England, Middle Atlantic, and Pacific census divisions than in other parts of the country.

How well the foregoing hypotheses are validated by the data depends partly on whether nonlabor inputs are substitutes (complements)for (to) labor inputs. Given the high level of aggregation, it is likely that the relationship is complementary. Therefore, if the above hypotheses are not supported by the data, then price variation is not the sole reason for variation in expenditures. Expenditure variation could arise from quantity (volume) variation and/or data quality problems.

4.3.1 Total Unadjusted Nonlabor and Labor Costs

Contrary to expectations, both nonlabor and labor costs per discharge were higher in larger hospitals than in smaller hospitals (Table 4-5). This suggests that quantity variation, possibly due to case mix and intensity of treatment differences, is an important factor in explaining cost variation and that quantity variation may be masking price variation. The role of quantity variation in explaining expenditure variation is further supported by increased

TABLE 4-5

MEAN NONLABOR AND LABOR COST PER DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]			AHA[b,d]		
	Nonlabor	Labor	Nonlabor Share	Nonlabor	Labor	Nonlabor Share
ALL HOSPITALS	**$1,915**	**$2,458**	**43.4%**	**$1,420**	**$2,533**	**35.8%**
Urban Hospitals	2,051	2,630	43.4	1,534	2,735	35.9
0 - 99 Beds	1,880	2,157	45.9	1,169	2,027	36.2
100 - 199 Beds	1,924	2,306	45.0	1,290	2,271	36.2
200 - 299 Beds	1,973	2,505	43.6	1,455	2,589	35.8
300 - 404 Beds	1,986	2,515	43.5	1,470	2,669	35.5
405 - 504 Beds	2,115	2,827	42.3	1,651	2,955	35.8
505 + Beds	2,331	3,181	41.8	1,949	3,460	36.2
Rural Hospitals	1,390	1,770	43.9	901	1,618	35.5
0 - 49 Beds	1,271	1,611	44.3	730	1,403	34.3
50 - 99 Beds	1,300	1,634	44.1	790	1,443	35.2
100 - 169 Beds	1,431	1,787	44.3	935	1,644	36.0
170 + Beds	1,507	1,978	43.3	1,065	1,874	36.0
No Special Status	1,338	1,657	44.4	838	1,495	35.6
Sole Community Hospital	1,412	1,868	43.1	857	1,667	33.9
Rural Referral Center	1,495	1,976	43.3	1,058	1,867	36.1
Teaching Status						
Non-teaching	1,702	2,107	44.2	1,181	2,063	36.1
Other Teaching	1,965	2,600	42.8	1,496	2,724	35.5
Major Teaching	2,717	3,558	42.6	2,160	3,879	35.5
Ownership						
State & Local Government	1,898	2,344	44.2	1,314	2,500	34.5
Voluntary	1,893	2,528	42.5	1,422	2,584	35.3
Proprietary	2,110	2,173	48.9	1,476	2,124	41.1
Disproportionate Share Status						
Did not qualify	1,823	2,349	43.5	1,302	2,319	35.8
Large Urban	2,126	2,715	43.4	1,619	2,905	35.7
Small Urban	1,720	2,080	45.3	1,408	2,450	36.2
Rural >= 100 beds (not SCH nor RRC)	1,169	1,390	45.3	768	1,280	37.3
Rural < 100 beds (not SCH nor RRC)	993	1,142	46.5	642	1,126	36.1
Sole Community Hospital	1,303	1,475	46.4	828	1,410	36.8
Rural Referral Center	1,450	1,741	45.8	1,085	1,734	37.9

TABLE 4-5 (continued)

MEAN NONLABOR AND LABOR COST PER DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]			AHA[b,d]		
	Nonlabor	Labor	Nonlabor Share	Nonlabor	Labor	Nonlabor Share
Initial PPS Waiver Status						
Non-Waivered	1,970	2,405	44.7	1,413	2,461	36.3
Waivered	1,608	2,765	36.8	1,392	2,843	33.1
Census Division						
New England	1,666	2,982	35.8	1,392	3,117	30.8
Mid Atlantic	1,748	2,747	38.5	1,451	2,833	33.8
South Atlantic	1,896	2,275	45.0	1,434	2,350	37.6
East North Central	1,956	2,609	42.4	1,416	2,582	35.0
East South Central	1,715	1,909	46.7	1,202	1,951	37.8
West North Central	1,837	2,349	43.7	1,264	2,316	35.0
West South Central	1,958	2,076	48.0	1,381	2,186	38.5
Mountain	1,933	2,142	46.6	1,377	2,343	36.5
Pacific	2,374	2,722	46.2	1,580	2,794	36.0
Census Region						
Northeast	1,728	2,806	37.8	1,436	2,906	33.0
South	1,876	2,137	46.3	1,369	2,216	37.9
North Central	1,920	2,531	42.8	1,372	2,505	35.0
West	2,258	2,569	46.3	1,528	2,679	36.2
PPS Urban Size						
Other Urban	1,901	2,439	43.5	1,406	2,475	36.2
Large Urban	2,195	2,812	43.4	1,660	2,990	35.6
MSA Population Size						
Less than .25 Million	1,814	2,287	44.1	1,328	2,276	36.5
.25 - 1 Million	1,936	2,500	43.3	1,437	2,553	36.0
1 - 3 Million	2,151	2,653	44.1	1,579	2,805	36.0
3+ Million	2,257	3,035	42.3	1,773	3,249	35.2

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

[c] Weight = Total hospital inpatient discharges (F88) from MCR data.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

labor cost. Although larger hospitals pay higher wages than smaller hospitals, the increase labor cost per discharge (47 percent - MCR data, 71 percent - AHA data) from the smallest to the largest urban hospital size group exceeds the small (6-7 percent (Pope and Adamache, 1992)) wage premium paid by the largest hospitals. This suggests an increased use of labor per discharge in larger hospitals.

Also contrary to expectations, nonlabor and labor cost per discharge were both higher in major teaching hospitals than in "other" teaching hospitals which, in turn, had higher costs per discharge than non-teaching hospitals. Nonlabor cost per discharge was higher in urban hospitals than in rural hospitals, and was higher in larger urban areas than in smaller urban areas. While hospitals in the Pacific census division had the highest nonlabor cost per discharge, hospitals in the New England and Middle Atlantic census divisions were among the lowest.[4] On the other hand, according to expectations, nonlabor cost per discharge was higher in proprietary than in voluntary or public hospitals. MCR and AHA data concur on these findings except for the census division results. Using AHA data, nonlabor cost per discharge is, as expected, highest in the Pacific and Middle Atlantic census divisions; New England, however, was lower than average.

The hospital attribute results, in particular those regarding bedsize and teaching status, do not support the hypotheses about their relationships with unit prices which, in turn, suggests that quantity variation is an important factor in geographic cost variation. Is is also possible that what appears to be geographic variation in nonlabor cost may be geographic variation in hospital size or teaching status.There were hospitals whose AHA values grossly exceeded their MCR values.

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[4] The New England and Middle Atlantic census divisions contain three (New York, New Jersey, and Massachusetts) of the four states which initially had PPS waivers. These states, along with Maryland, were considered to have the toughest state prospective reimbursement programs prior to the implementation of PPS. The MCR data, but not the AHA data, indicates that nonlabor cost per discharge were significantly lower in the waivered states than in the non-waivered states. Note, however, that labor cost per discharge were considerably higher in the waivered states than in the non-waivered states.

4.3.2 Total Case-Mix Adjusted Nonlabor and Labor Cost per Discharge

The most serious problem with the results in Table 4-4 is that there was no control for case mix complexity. For instance, teaching hospitals and large hospitals are more likely to treat cases that require more intensive treatment than small hospitals. More intensive treatment can be expected to include more nonlabor as well as labor inputs. Some of the patterns of cost per discharge (Table 4-6), after adjusting for case mix, are similar to those based on Table 4-5. The MCR and AHA data do not give as similar results in Table 4-6 as they did in Table 4-5.

Nonlabor cost per case-mix adjusted discharge, based on AHA data, was higher in large hospitals than in small hospitals (Table 4-6). This result is the same as in Table 4-5 except that the cost range is compressed from $780 to $356 per discharge (urban hospitals) and from $335 to $173 (rural hospitals). The nonlabor cost per case-mix adjusted discharge based on MCR data in Table 4-6, however, was completely different from Table 4-5. For urban hospitals, nonlabor cost per case-mix adjusted discharge declines at first as size increases, and then, after reaching a low of $1,894 for hospitals with 300-404 beds, increases. The relationship between cost per case-mix adjusted discharge and hospital size is U-shaped for urban hospitals (Panel A in Figure 4-1). In contrast, rural hospitals exhibited a roller-coaster cost-size relationship between costs and hospital size (Panel B in Figure 4-1). Thus, the nonlinear relationship between hospital size and nonlabor cost per discharge (MCR data), makes it difficult to ascertain the role, if any, of the effect of price variation on cost variation. And the fact that AHA data do not depict the same relationship further contributes to the difficulty in identifying the factors associated with costs by hospital size.

Teaching hospitals are still more expensive than non-teaching hospitals after adjusting for case mix. However, the differential between major teaching and non-teaching hospitals fell from about $1,000 to about $600-700 per discharge. The nonlabor cost per discharge by hospital ownership did not markedly change after adjusting for case mix. The urban hospitals still have greater nonlabor costs per discharge than rural hospitals but the differential fell from about $600 per discharge to $450 per discharge. However, even though nonlabor cost per

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TABLE 4-6

MEAN NONLABOR AND LABOR COST PER CASE-MIX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
ALL HOSPITALS	$1,897	$2,443	$1,384	$2,488
Urban Hospitals	1,980	2,554	1,476	2,651
0 - 99 Beds	2,168	2,508	1,344	2,351
100 - 199 Beds	2,028	2,451	1,363	2,411
200 - 299 Beds	1,958	2,512	1,446	2,597
300 - 404 Beds	1,894	2,427	1,407	2,576
405 - 504 Beds	1,949	2,631	1,518	2,736
505 + Beds	2,031	2,794	1,700	3,044
Rural Hospitals	1,566	2,002	1,007	1,820
0 - 49 Beds	1,612	2,052	925	1,775
50 - 99 Beds	1,533	1,930	930	1,704
100 - 169 Beds	1,583	1,993	1,035	1,830
170 + Beds	1,559	2,052	1,098	1,946
No Special Status	1,565	1,950	976	1,751
Sole Community Hospital	1,649	2,189	990	1,935
Rural Referral Center	1,548	2,050	1,093	1,940
Teaching Status				
Non-teaching	1,795	2,241	1,238	2,183
Other Teaching	1,869	2,484	1,414	2,594
Major Teaching	2,408	3,181	1,925	3,492
Ownership				
State & Local Government	1,914	2,390	1,318	2,523
Voluntary	1,859	2,496	1,383	2,535
Proprietary	2,117	2,188	1,487	2,154
Disproportionate Share Status				
Did not qualify	1,840	2,382	1,302	2,333
Large Urban	2,022	2,600	1,539	2,785
Small Urban	2,088	2,607	1,670	3,051
Rural >= 100 beds (not SCH nor RRC)	1,373	1,632	904	1,508
Rural < 100 beds (not SCH nor RRC)	1,288	1,482	836	1,470
Sole Community Hospital	1,556	1,786	978	1,679
Rural Referral Center	1,477	1,768	1,115	1,801

TABLE 4-6 (continued)

MEAN NONLABOR AND LABOR COST PER CASE-MIX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
Initial PPS Waiver Status				
Non-Waivered	1,940	2,380	1,380	2,420
Waivered	1,642	2,820	1,410	2,894
Census Division				
New England	1,706	3,045	1,405	3,166
Mid Atlantic	1,744	2,753	1,435	2,825
South Atlantic	1,862	2,245	1,397	2,309
East North Central	1,945	2,609	1,395	2,567
East South Central	1,747	1,963	1,223	1,994
West North Central	1,798	2,304	1,213	2,239
West South Central	1,936	2,062	1,357	2,162
Mountain	1,910	2,151	1,357	2,331
Pacific	2,285	2,618	1,511	2,682
Census Region				
Northeast	1,734	2,826	1,428	2,912
South	1,860	2,130	1,348	2,198
North Central	1,901	2,517	1,343	2,472
West	2,186	2,495	1,472	2,593
PPS Urban Size				
Other Urban	1,836	2,373	1,353	2,399
Large Urban	2,118	2,728	1,597	2,898
MSA Population Size				
Less than .25 Million	1,774	2,246	1,292	2,227
.25 - 1 Million	1,861	2,424	1,376	2,466
1 - 3 Million	2,052	2,543	1,498	2,677
3+ Million	2,210	2,984	1,737	3,207

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

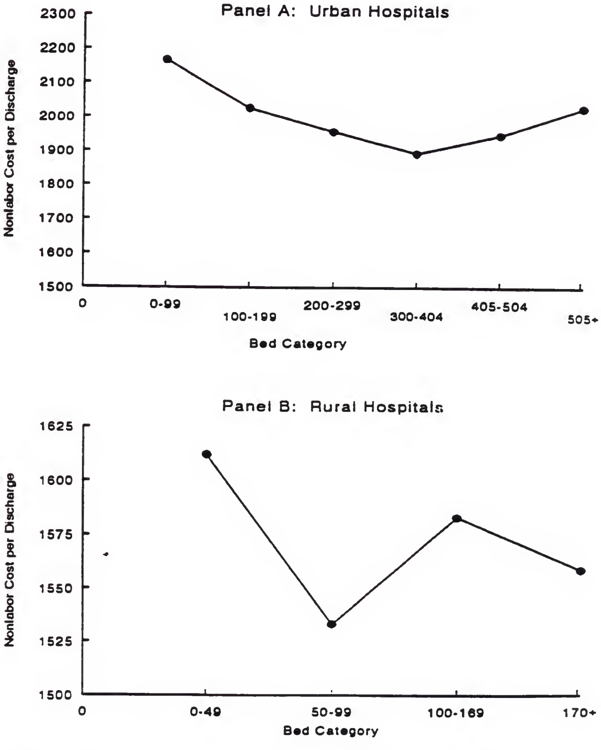
[c] Weight = Total hospital inpatient discharges (F88) from MCR data adjusted by casemix.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data adjusted by casemix.

Source: 1989 Medicare Cost Reports and AHA *Annual Survey*.

FIGURE 4-1

Nonlabor Cost per Case-Mix Adjusted Discharge by Hospital Size



discharge was lower for each urban size, there was little change in the differential between hospitals in smaller urban areas than in larger urban areas. MCR and AHA data still do not give similar results by census division. While the Pacific census division has the highest nonlabor cost per discharge whether using MCR or AHA data, the other rankings continue to be dissimilar. Adjusting nonlabor cost per discharge by case mix does, however, reduce the percentage difference between the highest and lowest census divisions. Adjusting for case mix reduces the census division nonlabor cost differential from 42 percent to 33 percent (MCR data) and from 31 percent to 25 percent (AHA data). The remaining nonlabor expenditure (cost) differential by census division may still reflect quantity differences as well as price differentials. The quantity differences could result from intra-case mix differences in the intensity of treatment. A confounding factor, as noted earlier, is the possibility of a negative correlation between price and expenditures.

4.3.3 Total Wage-Index Adjusted Nonlabor and Labor Cost per Discharge

An alternative adjustment factor utilized was the PPS wage index (Table 4-7). The patterns by hospital attribute of nonlabor and labor cost per discharge were similar to those for unadjusted costs (Table 4-5). The largest differences between the two tables were changes to the sizes of geographic differentials. For instance, the urban/rural differential for nonlabor cost per discharge was $700 (MCR data) in Table 4-5 while it was $285 in Table 4-7. Among urban class sizes, the nonlabor cost differentials almost disappear in Table 4-7. And the Pacific census division no longer has the highest nonlabor cost per discharge.

4.3.4 Medicare Nonlabor and Labor Cost per Discharge: Unadjusted

Unadjusted Medicare nonlabor and labor costs per discharge are presented in Table 4-8. The basic patterns of nonlabor costs found in Table 4-5 are present in Table 4-8. While the rankings are still the same, many of the differentials increased. Thus while the urban/rural difference was about $675 (MCR data) for nonlabor cost per discharge (Table 4-5), it was about

TABLE 4-7

MEAN NONLABOR AND LABOR COST PER WAGE INDEX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
ALL HOSPITALS	**$1,928**	**$2,450**	**$1,408**	**$2,494**
Urban Hospitals	1,985	2,524	1,483	2,621
0 - 99 Beds	1,819	2,091	1,129	1,958
100 - 199 Beds	1,850	2,207	1,242	2,176
200 - 299 Beds	1,903	2,394	1,400	2,470
300 - 404 Beds	1,937	2,447	1,438	2,585
405 - 504 Beds	2,081	2,748	1,610	2,864
505 + Beds	2,236	3,009	1,867	3,276
Rural Hospitals	1,700	2,154	1,104	1,973
0 - 49 Beds	1,542	1,949	896	1,709
50 - 99 Beds	1,593	2,000	977	1,775
100 - 169 Beds	1,739	2,158	1,134	1,988
170 + Beds	1,858	2,415	1,307	2,287
No Special Status	1,643	2,033	1,033	1,840
Sole Community Hospital	1,638	2,159	1,000	1,935
Rural Referral Center	1,827	2,383	1,287	2,253
Teaching Status				
Non-teaching	1,784	2,202	1,231	2,143
Other Teaching	1,942	2,551	1,477	2,666
Major Teaching	2,521	3,242	1,992	3,534
Ownership				
State & Local Government	1,993	2,464	1,371	2,589
Voluntary	1,873	2,482	1,400	2,525
Proprietary	2,177	2,226	1,514	2,171
Disproportionate Share Status				
Did not qualify	1,858	2,378	1,319	2,336
Large Urban	2,067	2,615	1,569	2,789
Small Urban	1,674	2,014	1,359	2,338
Rural >= 100 beds (not SCH nor RRC)	1,530	1,824	1,005	1,675
Rural < 100 beds (not SCH nor RRC)	1,290	1,487	842	1,477
Sole Community Hospital	1,629	1,840	1,051	1,787
Rural Referral Center	1,872	2,231	1,406	2,244

TABLE 4-7 (continued)

MEAN NONLABOR AND LABOR COST PER WAGE INDEX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
Initial PPS Waiver Status				
Non-Waivered	2,012	2,452	1,440	2,496
Waivered	1,427	2,437	1,215	2,479
Census Division				
New England	1,502	2,670	1,247	2,775
Mid Atlantic	1,614	2,510	1,314	2,561
South Atlantic	2,040	2,443	1,532	2,508
East North Central	1,969	2,626	1,414	2,577
East South Central	2,034	2,269	1,421	2,308
West North Central	2,016	2,572	1,370	2,508
West South Central	2,197	2,335	1,556	2,457
Mountain	1,957	2,180	1,390	2,374
Pacific	1,954	2,254	1,307	2,311
Census Region				
Northeast	1,586	2,550	1,297	2,616
South	2,086	2,374	1,516	2,450
North Central	1,983	2,610	1,401	2,557
West	1,955	2,234	1,329	2,327
PPS Urban Size				
Other Urban	1,987	2,532	1,471	2,568
Large Urban	1,983	2,517	1,494	2,673
MSA Population Size				
Less than .25 Million	1,971	2,468	1,442	2,459
.25 - 1 Million	1,994	2,558	1,482	2,611
1 - 3 Million	2,011	2,466	1,478	2,605
3+ Million	1,944	2,588	1,517	2,767

[a] MCR = Medicare Cost Report.

[b] AHA = American Hospital Association.

[c] Weight = Total hospital inpatient discharges (F88) from MCR data adjusted by the PPS wage index.

[d] Weight = Total hospital inpatient discharges (DCH) from AHA data adjusted by the PPS wage index.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

TABLE 4-8

MEAN MEDICARE NONLABOR AND LABOR COST PER DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
ALL HOSPITALS	**$2,428**	**$3,138**	**$1,826**	**$3,251**
Urban Hospitals	2,669	3,446	2,012	3,573
0 - 99 Beds	2,232	2,601	1,441	2,522
100 - 199 Beds	2,507	3,039	1,724	3,026
200 - 299 Beds	2,595	3,331	1,931	3,444
300 - 404 Beds	2,649	3,399	1,986	3,580
405 - 504 Beds	2,709	3,620	2,205	3,907
505 + Beds	3,104	4,281	2,538	4,477
Rural Hospitals	1,678	2,139	1,135	2,048
0 - 49 Beds	1,332	1,684	833	1,595
50 - 99 Beds	1,526	1,916	1,000	1,824
100 - 169 Beds	1,803	2,263	1,188	2,117
170 + Beds	1,955	2,565	1,405	2,485
No Special Status	1,572	1,950	1,028	1,849
Sole Community Hospital	1,688	2,238	1,115	2,176
Rural Referral Center	1,919	2,532	1,385	2,452
Teaching Status				
Non-teaching	2,148	2,671	1,536	2,687
Other Teaching	2,609	3,490	2,020	3,671
Major Teaching	3,709	4,935	2,823	5,036
Ownership				
State & Local Government	2,250	2,769	1,548	2,909
Voluntary	2,442	3,283	1,849	3,368
Proprietary	2,598	2,688	1,937	2,790
Disproportionate Share Status				
Did not qualify	2,298	2,968	1,700	3,025
Large Urban	2,792	3,604	2,099	3,751
Small Urban	2,260	2,605	1,558	2,677
Rural >= 100 beds (not SCH nor RRC)	1,456	1,749	1,024	1,712
Rural < 100 beds (not SCH nor RRC)	1,160	1,339	794	1,394
Sole Community Hospital	1,558	1,751	1,130	1,927
Rural Referral Center	1,886	2,267	1,464	2,358

TABLE 4-8 (continued)

MEAN MEDICARE NONLABOR AND LABOR COST PER DISCHARGE PER SHORT-TERM ACUTE-CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
Initial PPS Waiver Status				
Non-Waivered	2,459	3,012	1,799	3,121
Waivered	2,263	3,895	1,906	3,890
Census Division				
New England	2,234	4,031	1,924	4,344
Mid Atlantic	2,399	3,757	1,908	3,721
South Atlantic	2,446	2,891	1,857	3,004
East North Central	2,442	3,271	1,823	3,319
East South Central	2,044	2,300	1,524	2,483
West North Central	2,199	2,778	1,511	2,950
West South Central	2,448	2,590	1,773	2,770
Mountain	2,481	2,713	1,788	2,984
Pacific	3,032	3,529	2,010	3,543
Census Region				
Northeast	2,359	3,824	1,912	3,878
South	2,353	2,666	1,757	2,818
North Central	2,366	3,117	1,729	3,148
West	2,880	3,304	1,953	3,400
PPS Urban Size				
Other Urban	2,449	3,154	1,834	3,226
Large Urban	2,909	3,763	2,205	3,946
MSA Population Size				
Less than .25 Million	2,322	2,925	1,705	2,914
.25 - 1 Million	2,503	3,251	1,886	3,352
1 - 3 Million	2,847	3,531	2,088	3,667
3+ Million	3,001	4,108	2,376	4,358

[a] MCR = Medicare Cost Report.
[b] AHA = American Hospital Association.
[c] Weight = Medicare hospital inpatient discharges (F82) from MCR data.
[d] Weight = Medicare hospital inpatient discharges (MCRDCH) from AHA data.

Source: 1989 Medicare Cost Reports and AHA *Annual Survey*.

$1,000 in Table 4-8 for Medicare discharges. Similarly, the major teaching/non-teaching differential increased from $1,000 to $1,550 (MCR data). Medicare nonlabor costs are higher in hospitals located in larger urban areas than in hospitals located in smaller urban hospitals. MCR and AHA data continue to give different results by census division. The Pacific census division has the highest Medicare nonlabor cost per discharge (MCR data); however, New England and the Middle Atlantic are no longer the lowest. Using AHA data, the Pacific had the highest Medicare nonlabor costs per discharge with New England and the Middle Atlantic the next two highest census divisions.

4.3.5 Medicare Nonlabor and Labor Cost per Discharge: Case-Mix Adjusted

Adjusting Medicare nonlabor and labor cost per discharge by case mix (Table 4-9) yields yet again another different pattern of costs by hospital size for estimates based on MCR data. This time it is the urban hospitals whose nonlabor cost-size relationship is characterized by a roller-coaster (i.e., a relationship similar to that depicted in Panel B of Figure 4-1). For rural hospitals, Medicare nonlabor cost per discharge is higher in larger hospitals than in smaller hospitals. Adjusting for case mix reduces but does not eliminate the teaching/non-teaching Medicare cost differential. The census division results in Table 4-9 are similar to those in Table 4-8 for both MCR and AHA data.

4.4 Summary

Both MCR and AHA measures of nonlabor and labor cost per discharge exhibit considerable variation. In fact, variation in nonlabor costs exceeds variation in labor costs, suggesting that a PPS adjustment for nonlabor cost variation may be appropriate. The variation is not always the same, by hospital characteristic, for the two data sources. The most important similarity between the two data sources is that the variation in costs per discharge is associated with both individual hospital attributes such as ownership and with geographic location. Also important is that most of the key hypotheses regarding price variation by hospital attribute (e.g., size) were not met. These findings suggest that geographic variations

TABLE 4-9

MEAN MEDICARE NONLABOR AND LABOR COST PER CASE-MIX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
ALL HOSPITALS	$2,415	$3,129	$1,791	$3,212
Urban Hospitals	2,579	3,352	1,943	3,476
0 - 99 Beds	2,540	2,987	1,642	2,898
100 - 199 Beds	2,623	3,202	1,810	3,192
200 - 299 Beds	2,573	3,337	1,921	3,461
300 - 404 Beds	2,525	3,279	1,908	3,469
405 - 504 Beds	2,496	3,372	2,029	3,623
505 + Beds	2,688	3,737	2,200	3,902
Rural Hospitals	1,892	2,418	1,271	2,305
0 - 49 Beds	1,686	2,138	1,054	2,014
50 - 99 Beds	1,802	2,267	1,179	2,157
100 - 169 Beds	1,996	2,518	1,314	2,350
170 + Beds	2,030	2,673	1,455	2,591
No Special Status	1,839	2,290	1,198	2,164
Sole Community Hospital	1,966	2,617	1,287	2,521
Rural Referral Center	1,997	2,641	1,438	2,559
Teaching Status				
Non-teaching	2,260	2,836	1,612	2,843
Other Teaching	2,474	3,328	1,911	3,503
Major Teaching	3,241	4,347	2,481	4,456
Ownership				
State & Local Government	2,310	2,871	1,581	2,985
Voluntary	2,408	3,256	1,809	3,324
Proprietary	2,586	2,684	1,945	2,818
Disproportionate Share Status				
Did not qualify	2,324	3,018	1,705	3,055
Large Urban	2,661	3,458	2,003	3,609
Small Urban	2,584	2,987	1,773	3,123
Rural >= 100 beds (not SCH nor RRC)	1,704	2,048	1,202	2,012
Rural < 100 beds (not SCH nor RRC)	1,507	1,740	1,033	1,817
Sole Community Hospital	1,845	2,096	1,334	2,291
Rural Referral Center	1,942	2,331	1,513	2,462

TABLE 4-9 (continued)

MEAN MEDICARE NONLABOR AND LABOR COST PER CASE-MIX ADJUSTED DISCHARGE PER SHORT-TERM ACUTE CARE HOSPITAL, 1989

	MCR[a,c]		AHA[b,d]	
	Nonlabor	Labor	Nonlabor	Labor
Initial PPS Waiver Status				
Non-Waivered	2,429	2,990	1,766	3,085
Waivered	2,327	3,997	1,947	3,991
Census Division				
New England	2,296	4,143	1,945	4,420
Mid Atlantic	2,414	3,791	1,910	3,748
South Atlantic	2,406	2,858	1,820	2,967
East North Central	2,442	3,289	1,807	3,320
East South Central	2,108	2,390	1,558	2,553
West North Central	2,157	2,727	1,461	2,678
West South Central	2,426	2,581	1,746	2,746
Mountain	2,451	2,724	1,766	2,980
Pacific	2,892	3,362	1,918	3,388
Census Region				
Northeast	2,385	3,877	1,919	3,917
South	2,342	2,668	1,739	2,809
North Central	2,353	3,113	1,703	3,127
West	2,771	3,188	1,879	3,284
PPS Urban Size				
Other Urban	2,372	3,078	1,771	3,141
Large Urban	2,804	3,649	2,128	3,835
MSA Population Size				
Less than .25 Million	2,276	2,876	1,665	2,862
.25 - 1 Million	2,413	3,163	1,813	3,254
1 - 3 Million	2,716	3,388	1,993	3,524
3+ Million	2,935	4,038	2,327	4,294

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[a] MCR = Medicare Cost Report.
[b] AHA = American Hospital Association.
[c] Weight = Medicare hospital inpatient discharges (F82) from MCR data.
[d] Weight = Medicare hospital inpatient discharges (MCRDCH) from AHA data.

Source: 1989 Medicare Cost Reports and AHA Annual Survey.

in cost per discharge reflect quantity as well as any geographic price variation that may exist. In addition, the high degree of correlation between labor and nonlabor cost variation suggests that underlying intensity of treatment factors may be driving both costs. Adjusting costs per discharge by case mix did not eliminate geographic cost variation. The residual variation, however, cannot necessarily be attributed to price variation.

Average hospital labor cost per discharge is roughly the same whether using MCR or AHA data. Nonlabor cost per discharge is considerably higher on average when using MCR data instead of AHA data. The AHA values of nonlabor cost per discharge appear to be more reasonable than estimates based on MCR data. However, as stated in Chapter 3, AHA data is contaminated by capital costs, labor-related costs (e.g., contract labor), and non-reimbursable items such as federal and state income taxes which are not normally recognized as costs.

5.0 MULTIVARIATE RESULTS

In this chapter, we examine the simultaneous relationship of many variables to hospital nonlabor cost per discharge using multiple regression. We estimate two basic models: an explanatory model and a policy model. The explanatory model includes those factors that may be related to nonlabor cost per discharge. The policy model includes only variables currently used in the PPS payment system. Each of these models is estimated for Medicare Cost Report and AHA variants of total and Medicare nonlabor cost per discharge.

We first discuss the relationship of specific explanatory and policy variables to nonlabor costs. We determine whether geographic variation in nonlabor costs that might warrant a PPS payment adjustment exists once other relevant factors are held constant. Then we examine the percentage of variance in nonlabor costs explained by alternative models. In particular, we focus on whether the PPS hospital wage index, or the partial index of nonlabor prices described in Chapter 2, explains substantial variation in nonlabor cost per discharge that is not correlated with other variables. Finally, we examine the correlations of the explanatory variables with the residuals from the policy model to determine which factors affecting nonlabor costs are not accounted for by the policy variables.

As discussed in Chapter 4, nonlabor expenditures represent prices multiplied by quantities. Expenditures are not a pure measure of geographic nonlabor input price differences unless all hospitals buy the same types and quantities of nonlabor inputs, which is highly unlikely. In the multivariate context, factors thought to affect input quantities can be held constant, making residual variation more likely to reflect price differences. Nevertheless, because it is not possible to control for all influences on quantities, residual geographic variation, or variation correlated with the PPS wage index, may still represent quantity, not price, differences. In addition, measuring hospital nonlabor expenditures accurately from available data is difficult, as discussed in Chapter 3. Thus, our measures of nonlabor expenditures may reflect hospital capital, labor, or contract service expenses to an unknown extent.

5.1 Relationship of Explanatory and Policy Variables to Nonlabor Cost Per Discharge

The relationships of the explanatory and policy variables to hospital nonlabor cost per discharge were estimated using multiple regression techniques. Nonlabor cost per discharge and the continuous regressors--casemix, surgeries per discharge, interns/residents per bed, and the PPS wage index--were entered in natural logarithm form. Hence, the effects of continuous variables are estimated as elasticities, i.e., the percentage change in nonlabor cost per discharge associated with a one percent change in the regressor. The other explanatory variables are all binary "dummy" variables, with one category omitted. All effects for these variables are percentage differences from the omitted category. All regressions were weighted by the appropriate measure of discharges, so that they can be interpreted on a "per case" basis.

5.1.1 Explanatory Variables

Table 5-1 presents the relationship of explanatory variables to hospital nonlabor cost per discharge. The explanatory variables include Medicare casemix, surgeries per discharge, urbanicity, Census Division, Alaska, Hawaii, and hospital bedsize, teaching status, ownership, affiliation, payment status, and service mix. Medicare casemix has a strong relationship with all variants of nonlabor cost per discharge, with an elasticity slightly above one. Thus, a 10 percent increase in a hospital's casemix index is associated with an 11-12 percent average increase in its nonlabor cost per discharge, all else constant. Based on these coefficients, the current practice of adjusting PPS nonlabor payments for hospital casemix is justified.

Hospitals located in large urban areas have substantially higher nonlabor costs than hospitals in other urban areas, which in turn are more costly than rural hospitals. The AHA data show a larger effect of urban/rural location than the MCR data, and the effect is greater for Medicare costs than for total costs. Higher urban costs are not consistent with the hypothesis of higher nonlabor prices in rural areas because of transportation costs. Either this

TABLE 5-1

RELATIONSHIP OF EXPLANATORY VARIABLES TO HOSPITAL NONLABOR COST PER DISCHARGE

Variable	MCR Total	MCR Medicare	AHA Total	AHA Medicare
Medicare Casemix Index[a]	1.10*	1.14*	1.14*	1.23*
Surgeries per Discharge[a]	0.002	0.01	0.001	0.01
URBANICITY[b]				
Large Urban	27.6*%	36.9*%	40.1*%	49.7*%
Other Urban	15.1*	18.9*	23.2*	27.9*
CENSUS DIVISION[c]				
New England	2.0	5.7*	18.6*	28.6*
Mid Atlantic	5.9*	10.4*	14.8*	14.6*
South Atlantic	7.4*	11.4*	15.5*	19.5*
East North Central	9.0*	9.4*	11.5*	15.9*
East South Central	6.3*	5.4*	8.2*	11.8*
West South Central	4.3*	9.7*	9.2*	17.8*
Mountain	5.1*	11.3*	12.6*	17.9*
Pacific	15.9*	17.7*	10.2*	13.7*
STATE[d]				
Alaska	11.1	19.9	41.1*	23.6
Hawaii	15.5	42.8*	15.8	3.9
BEDSIZE[e]				
100 - 249	-0.4	4.7*	6.8*	10.4*
250 - 399	-6.6*	1.2	4.7*	10.9*
400 +	-12.6*	-4.5*	7.7*	13.7*
TEACHING STATUS[f]				
Major Teaching	24.7*	24.0*	23.2*	18.0*
Other Teaching	1.8	2.3*	2.5*	3.7*
OWNERSHIP[g]				
Public	-1.0	0.9	-3.9*	-2.3
For-Profit	9.1*	6.7*	13.2*	11.2*
AFFILIATION				
System	6.0*	3.6*	3.1*	1.6
Alliance	-2.4*	-1.8	1.1	-1.1
PAYMENT STATUS				
Sole Community	5.3	4.4*	0.6	6.7
Rural Referral Center	3.0	6.0*	9.4*	11.9*
Disp. Share — Large Urban	-0.5	3.3*	3.5*	2.6*
Disp. Share — Small Urban	0.4	-2.2	16.8*	-11.4
Disp. Share — Rural	-9.1*	-5.0*	-1.4	3.3
Waivered State	-13.5*	-5.9*	-6.7*	-0.6
SERVICES				
AIDS Unit	-4.3*	-1.5	0.3	-4.8*
Open Heart Surgery	3.7*	1.9	6.2*	2.1
CT Scanner	0.2	2.5	0.0	1.1
MRI	2.2*	0.9	2.5*	3.3*
Pharmacy	-5.8*	-0.9	-3.4	0.3
C.O.P.D.	-2.0	-0.7	-1.5	1.8
Emergency Dept.	-16.0*	-10.7*	-17.3*	-13.6*
ESWL	4.5*	2.0	1.7	1.6
Organ Transplant	7.7*	5.0*	7.7*	-1.1
In-Vitro Fertilization	8.2*	6.1*	3.9*	7.8*
Psych. Partial Hosp. Program	-1.1	-0.8	-1.3	-2.0
Diagnostic Radioisotope	-0.4	2.5	2.7	5.0*
Adjusted R^2	49.6	58.6	55.6	52.3
N	4,694	4,694	4,201	4,201

*Statistically significant at 5% or better level.

[a] Value is an elasticity, indicating the percentage change in cost per discharge arising from a 1% change in the variable.
[b] Percentage change relative to rural.
[c] Percentage change relative to West North Central.
[d] Percentage change relative to Pacific.
[e] Percentage change relative to less than 100 beds.
[f] Percentage change relative to non-teaching.
[g] Percentage change relative to non-profit.

Note: Based on logarithmic regression equations weighted by hospital discharges. Binary variable coefficients have been adjusted by the formula exp(coefficient) - 1 to obtain percentage differences from the omitted category. MCR = Medicare Cost Reports; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey of Hospitals.

hypothesis is incorrect, or else the greater nonlabor input quantities of urban hospitals overwhelm price differences.

There is also expenditure variation across Census Divisions, but the MCR and AHA data show inconsistent regional patterns (the percentages in Table 5-1 are relative to the West North Central region). In the MCR data, costs in the Pacific Division are higher than in any other region, while New England has relatively low costs. In the AHA data, on the other hand, New England has the highest costs in the nation, while the Pacific's costs are among the lowest. It seems safe to conclude, however, that the substantial urban-rural and regional variation in nonlabor costs per discharge, even after controlling for other factors affecting costs, could justify a geographic payment adjustment in the PPS.

The regression results provide some support for the PPS cost-of-living adjustment for Alaska and Hawaii. Their costs appear to substantially exceed the Pacific Division's, except perhaps for AHA Medicare costs. Only two of the 8 Alaska/Hawaii coefficients are statistically different from zero, however.

The MCR and AHA data give contradictory pictures of the relationship of hospital size to nonlabor cost per discharge. The MCR data shows a tendency of costs to fall as hospital size grows larger, especially for total nonlabor costs. This is consistent with the hypothesis of volume pricing discounts received by large hospitals. AHA data, on the other hand, shows that costs are higher in larger hospitals, although they are fairly uniform above 100 beds.

Both data sets indicate that major teaching hospitals have 20-25 percent higher nonlabor costs per discharge than non-teaching hospitals. Costs at other teaching hospitals, however, are only slightly higher than at non-teaching hospitals. For-profit hospitals have higher nonlabor costs than nonprofits for all cost variants. Hospitals that are members of systems have slightly higher costs, other things equal. They do not appear to reap buying advantages from system membership. Hospitals that are members of an (purchasing) alliance may have slightly lower costs, but the effect is not strong. Sole community and rural referral centers appear to have slightly higher costs, ceteris paribus, initially PPS waivered states with strong state regulatory programs (New Jersey, New York, Massachusetts, Maryland) have lower costs, and the effect of disproportionate share status depends on urban/rural location.

We had hypothesized that several hospital services might have a significant relationship to nonlabor cost per discharge. Open heart surgery, magnetic resonance imaging, organ transplant, and in-vitro fertilization appear to raise costs, perhaps because of the supplies, drugs, or energy expenditures that they entail. These services may also be proxying for other characteristics of the hospitals that offer them, such as a more intensive style of care. AIDS unit, pharmacy department, and especially emergency department appear to have a negative impact on nonlabor costs. AIDS unit and emergency department may be proxying for the type of hospitals that offer, or do not offer, the service. AIDS units are probably more frequently offerred by inner-city hospitals with constrained financial resources, and therefore, lower costs. Most hospitals have an emergency department. The ones that do not may tend to be located in wealthier suburban areas and thus have higher costs.

5.1.2 Policy Variables

Tables 5-2 and 5-3 show the relationship of policy variables to hospital nonlabor cost per discharge. In Table 5-2, nonlabor costs are measured from Medicare Cost Report data, and in Table 5-3 from American Hospital Association data. Three policy regressions were estimated. The first variant includes neither geographic location indicators nor the PPS hospital wage index. The second includes geographic indicators, but not the wage index. The third includes the wage index, but not the geographic indicators. The percentage of variance explained by these regressions will be discussed in the following section. We focus on the magnitude of individual variable effects in this section.

As in the explanatory models, casemix has a strong, consistent effect on costs. Its estimated elasticity is higher than in the explanatory model, presumably because of the fewer variables included in the policy regressions. Interns/residents per bed--a measure of teaching intensity--also has a consistently significant positive impact on nonlabor costs, with a larger effect on AHA costs than MCR costs.

Among the geographic indicators, urbanicity has a large, positive impact on nonlabor costs. The effect on AHA costs is greater than on MCR costs. Costs in Alaska and Hawaii are

TABLE 5-2

RELATIONSHIP OF POLICY VARIABLES TO MEDICARE COST REPORT NONLABOR COST PER DISCHARGE

VARIABLE	TOTAL			MEDICARE		
PPS Wage Index[a]	—	—	0.38*	—	—	0.57*
Medicare Casemix Index[a]	1.40*	1.22*	1.35*	1.59*	1.31*	1.48*
Interns/Residents per Bed[a]	0.003*	0.004*	0.002*	0.004*	0.003*	0.002*
Sole Community (SCH)	-4.5%	1.3%	-0.7%	-9.0%	2.5%	-3.8%
Rural Referral Center (RRC)	-13.3*	-3.3*	-7.6*	-11.8*	6.3*	-3.4*
DISPROPORTIONATE SHARE[b]						
Large Urban	2.5*	0.7	1.9*	6.6*	3.4*	5.5*
Small Urban	7.9	-2.5	4.4	-0.1	-9.3	-2.2
Rural—Large Urban	-8.9	1.1	-2.1	-7.3*	12.9*	2.5
Rural—Small Urban	62.1*	79.3*	72.2*	51.3*	82.4*	68.2*
Large Rural	-20.7*	-14.5*	-13.4*	-19.4*	-6.1	-8.8*
Small Rural	-23.9*	-19.7*	-17.5*	-25.7*	-16.7*	-17.3*
Sole Community	-5.0	-3.9	-2.0	-3.6	-2.4	0.4
Rural Referral Center	-5.4	-5.2	-2.6	-3.0	-2.4	1.1
URBANICITY[c]						
Large Urban	—	14.7*	—	—	36.3*	—
Other Urban	—	3.8	—	—	21.0*	—
STATE[d]						
Alaska	—	13.4	—	—	37.7*	—
Hawaii	—	16.4*	—	—	18.8*	—
CENSUS DIVISIONS[e]						
New England	—	-7.0*	—	—	2.1	—
Mid Atlantic	—	-9.2*	—	—	1.8	—
South Atlantic	—	4.1	—	—	10.8*	—
East North Central	—	5.8*	—	—	8.5*	—
East South Central	—	5.2*	—	—	5.3*	—
West South Central	—	5.6*	—	—	10.3*	—
Mountain	—	5.7*	—	—	12.4*	—
Pacific	—	17.0*	—	—	18.7*	—

*Statistically significant at 5% or better level.

[a] Value is an elasticity, indicating the percentage change in cost per discharge arising from a 1% change in the variable.

[b] Percentage difference from non-disproportionate share.

[c] Percentage difference from rural.

[d] Percentage difference relative to Pacific.

[e] Percentage difference relative to West North Central.

Note: Based on logarithmic regression equations weighted by hospital discharges. Binary variable coefficients have been adjsuted by the formula exp(coefficient) - 1 to obtain percentage differences from the omitted category. MCR = Medicare Cost Report; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey of Hospitals.

TABLE 5-3

RELATIONSHIP OF POLICY VARIABLES TO AMERICAN HOSPITAL ASSOCIATION NONLABOR COST PER DISCHARGE

VARIABLE	TOTAL			MEDICARE		
PPS Wage Index[a]	—	—	0.61*	—	—	0.77*
Medicare Casemix Index[a]	1.63*	1.44*	1.55*	1.75*	1.46*	1.63*
Interns/Residents per Bed[a]	0.009*	0.007*	0.007*	0.009*	0.006*	0.006*
Sole Community (SCH)	-18.0%*	-2.4%	-12.4%*	-17.9%	3.6%	-11.2%*
Rural Referral Center (RRC)	-1.4*	8.9*	-4.1*	-12.5*	17.9*	-1.0*
DISPROPORTIONATE SHARE[b]						
Large Urban	8.2*	5.1*	7.3*	7.9*	3.4*	6.7*
Small Urban	27.5*	16.5	21.2*	4.8	-7.1	1.5
Rural—Large Urban	-4.2	22.8	5.9	-5.1	31.3*	7.4
Rural—Small Urban	87.7*	131.6*	112.4*	50.0	103.3*	80.3*
Large Rural	-21.2*	-4.8	-9.6*	-19.1*	3.4	-4.3
Small Rural	-26.1*	-13.0*	-15.6*	-28.8*	-12.6*	-16.9*
Sole Community	2.4	4.4	8.1	8.8	10.2	15.9
Rural Referral Center	3.2	2.2	8.2	7.8	6.8	14.5
URBANICITY[c]						
Large Urban	—	45.7*	—	—	62.9*	—
Other Urban	—	23.8*	—	—	35.2*	—
STATE[d]						
Alaska	—	50.5*	—	—	36.0	—
Hawaii	—	14.1	—	—	4.5	—
CENSUS DIVISIONS[e]						
New England	—	14.7*	—	—	29.1*	—
Mid Atlantic	—	8.3*	—	—	15.3*	—
South Atlantic	—	17.9*	—	—	24.8*	—
East North Central	—	11.2*	—	—	17.6*	—
East South Central	—	11.7*	—	—	16.6*	—
West South Central	—	12.3*	—	—	20.2*	—
Mountain	—	15.0*	—	—	21.0*	—
Pacific	—	10.5*	—	—	14.3*	—

*Statistically significant at 5% or better level.

[a] Value is an elasticity, indicating the percentage change in cost per discharge arising from a 1% change in the variable.

[b] Percentage difference from non-disproportionate share.

[c] Percentage difference from rural.

[d] Percentage difference relative to Pacific.

[e] Percentage difference relative to West North Central.

Note: Based on logarithmic regression equations weighted by hospital discharges. Binary variable coefficients have been adjsuted by the formula exp(coefficient) - 1 to obtain percentage differences from the omitted category. MCR = Medicare Cost Report; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey of Hospitals.

high, justifying their cost-of-living allowance. There are also significant regional variations in cost, although the MCR and AHA data again show different regional patterns.

The PPS wage index is correlated with variations in hospital nonlabor cost per discharge, holding constant other policy variables (but excluding geographic indicators). Its estimated elasticity ranges from 0.38 to 0.77, the higher values occuring in the AHA regressions. Hence, the relationship of the wage index to nonlabor costs, although substantial, is less than proportional. The correlation provides a possible basis for a PPS nonlabor cost adjustment based on the area wage index. It should be remembered, however, that the wage index may be correlated with differences in nonlabor input quantities, or inaccuracies in our measurement of nonlabor expenditures, rather than nonlabor input prices.

5.2 Percentage of Variance in Nonlabor Costs Explained by Alternative Models

In Tables 5-4 and 5-5, we show the percentage of variance--the adjusted R-squared--in hospital nonlabor cost per discharge explained by alternative explanatory (Table 5-4) and policy (Table 5-5) models. Each table begins with a null model that excludes geographic location indicators and price indexes. Next, the geographic indicators--urbanicity, Census Division, Alaska, and Hawaii--are added to the null model. Finally, the price indexes--the PPS area wage index and our partial index of nonlabor input prices from Chapter 2--are added to the null model to examine their incremental contribution to variance explained.

The various models explain from 35 to 60 percent of the variance in the variants of nonlabor cost per discharge. As expected, the explanatory models explain more cost variation than the policy models. The geographic indicators add significant explanatory power to the null model, especially for the more parsimonious policy regressions. The input price indexes add some explanatory power to the null model, but not as much as the geographic indicators, especially in the policy model. The nonlabor price index is slightly less powerful than the PPS wage index when added to the null model. In the explanatory model, both the price indexes add some small explanatory power to the null model plus the geographic indicators. Once geographic location is held constant, the nonlabor price index adds more incremental explanatory power than the PPS wage index. Hence, the highest percentages of variance explained are in the models that include the geographic indicators and the nonlabor price index.

TABLE 5-4

PERCENTAGE OF VARIANCE IN NONLABOR COST PER DISCHARGE EXPLAINED BY ALTERNATIVE MODELS: EXPLANATORY VARIABLES (values in table are adjusted R-squares)

		NULL AND:			NULL, GEOGRAPHIC DUMMIES, AND:	
	Null[a]	Geographic Dummies[b]	PPS Wage Index	Nonlabor Price Index[c]	PPS Wage Index	Nonlabor Price Index[c]
MCR						
Total	45.7%	49.6%	49.1%	48.2%	50.1%	51.2%
Medicare	52.5	58.6	57.2	56.2	59.3	60.3
AHA						
Total	51.5	55.6	54.3	52.9	56.1	56.6
Medicare	47.0	52.3	50.1	49.9	52.7	54.3

[a] Excludes geographic dummies and price indexes.

[b] Nine Census Divsions, large urban, other urban, rural, Alaska, and Hawaii.

[c] Based on a smaller size than the other regressions because of missing values for the nonlabor input price index. Hence, percentages of variance explained are not strictly comparable to other columns.

Note: Based on logarithmic regression equations, weighted by hospital discharges. MCR = Medicare Cost Report; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey of Hospitals.

TABLE 5-5

PERCENTAGE OF VARIANCE IN NONLABOR COST PER DISCHARGE EXPLAINED BY ALTERNATIVE MODELS: POLICY VARIABLES (values in table are adjusted R-squares)

		NULL MODEL AND:		
	Null[a]	Geographic Dummies[b]	PPS Wage Index	Nonlabor Price Index[c]
MCR				
Total	35.7%	41.7%	37.7%	37.6%
Medicare	46.4	53.7	50.6	48.8
AHA				
Total	45.1	51.1	48.7	47.0
Medicare	41.7	50.7	46.6	45.5

[a] Excludes geographic dummies and price indexes.

[b] Includes large urban, other urban, rural, Alaska, and Hawaii, and nine Census Divsions.

[c] Based on a smaller size than the other regressions because of missing values for the nonlabor input price index. Hence, percentages of variance explained are not strictly comparable to other columns.

Note: Based on logarithmic regression equations, weighted by hospital discharges. MCR = Medicare Cost Reports; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey of Hospitals.

These results confirm our earlier finding that there is geographic (urban-rural, regional) variation in nonlabor cost per discharge that is not correlated with other explanatory or policy variables. Some nonlabor cost variation is also correlated with the PPS area wage index and our partial nonlabor price index. However, the incremental contributions of the price indexes to explaining variation in nonlabor costs are small.

5.3 Relationship of Explanatory Variables to Residual Cost Variation

To determine the aspects of nonlabor cost variation that are not accounted for by the policy model, we regressed the residuals from the policy models (including the PPS wage index--see Table 5-3) on explanatory variables not included in the policy model. We estimated residual regressions both excluding and including our partial nonlabor price index from Chapter 2. These results are presented in Table 5-6.

From 10 to 20 percent of the residual cost variation is correlated with the explanatory variables; the rest is "noise." There are significant regional and urban-rural differences even after controlling for the PPS wage index and the other policy variables. Similarly, in most cost variants, major teaching hospitals still have higher costs even after controlling for the interns and residents to beds ratio. Other significant residual effects include hospital bedsize, for-profit ownership, system affiliation, and some hospital services. Our partial index of nonlabor input prices has a statistically significant relationship to residual cost variation from the policy model, holding other variables constant. Thus, it captures aspects of nonlabor cost variation not correlated with the PPS wage index and the other policy variables.

Overall, the results in Table 5-5 suggest that significant systematic variation in nonlabor cost per discharge remains even after adjusting for policy variables including the PPS wage index. This suggests that systematic "winners" and "losers" will persist even if a PPS-wage-index-based adjustment for nonlabor costs is made. Moreover, the results imply that other factors accounting for nonlabor cost variation should be investigated further, including nonlabor input prices.

TABLE 5-6

RELATIONSHIP OF EXPLANATORY VARIABLES TO VARIATIONS IN NONLABOR COST PER DISCHARGE NOT EXPLAINED BY POLICY VARIABLES

	MCR				AHA			
Variable	Total	Total	Medicare	Medicare	Total	Total	Medicare	Medicare
Nonlabor Price Index[a]	—	0.49*	—	0.46*	—	0.29*	—	0.12*
CENSUS DIVISION[b]								
New England	-1.4%	-2.7%*	-1.4%	-19.8%*	9.9%*	1.9%	15.6%*	12.2%*
Mid Atlantic	5.1*	7.3*	6.6*	5.1*	9.7*	9.9*	7.5*	6.0
South Atlantic	5.2*	-4.2	8.8*	-1.9	14.1*	10.0*	17.2*	15.0*
East North Central	7.2*	2.7	6.2*	1.2	8.4*	7.0*	11.1*	10.0*
East South Central	8.6*	1.6	9.0*	1.5	12.7*	10.2*	16.6*	15.5*
West South Central	6.0*	-4.9*	12.0	1.6	12.3*	4.9	21.3*	17.3*
Mountain	1.7	-9.3*	5.9*	-6.0	7.8*	-0.6	11.3*	4.5
Pacific	5.3*	-7.4	1.4	-10.6*	-5.0*	-11.0*	-6.1*	-9.0*
STATE[c]								
Alaska	0.7	7.0	4.6	9.8	21.5	27.6	2.9	7.0
Hawaii	15.0	—	42.4*	—	15.1	—	2.7	—
URBANICITY[d]								
Large Urban	9.4*	5.8*	12.9*	8.9*	11.8*	11.1*	15.0*	14.9*
Other Urban	2.5	1.1	3.6*	2.0	3.6*	2.2	5.2*	3.2
BEDSIZE[e]								
100-249	0.3	0.4	4.2*	4.8*	6.3*	6.2*	9.5*	10.0*
250-399	-6.0*	-6.1*	0.6	0.8	3.9	2.7	9.8*	8.6*
400+	-12.8*	-13.0*	-6.0*	-6.8*	5.6*	5.3	11.1*	11.5*
OWNERSHIP[f]								
Public	-0.1	-0.6	1.7	2.0	-3.1*	-3.7*	-1.7	-2.3
For-Profit	8.2*	-7.6*	4.8*	4.6*	10.3*	10.6*	8.1*	8.5*
AFFILIATION								
System	5.5*	6.0*	3.0*	3.0*	2.8*	2.3*	1.1	1.0
Alliance	-2.5*	-1.8	-1.8*	-1.7*	1.1	2.2	-0.8	0.4
TEACHING[g]								
Major Teaching	18.8*	19.3*	16.0*	19.6*	6.5*	5.6*	2.0	1.0
Other Teaching	-1.1	-0.5	-1.3	-0.1	-8.2*	-8.4*	-6.1*	-6.1*
SERVICES								
AIDS Unit	-5.3*	-5.6*	-3.8	-1.0	-2.1	-3.0	-8.5*	-10.8*
Open Heart Surgery	-0.1	-0.1	-2.9*	-3.1*	0.3	1.4	-3.2*	-0.9
CT Scanner	-0.3	0.1	1.9	2.4	-0.9	1.5	0.5	2.8
MRI	3.0*	3.5*	1.6	2.0*	3.2*	2.3	4.0*	1.9
Pharmacy	-6.0*	-6.5*	-1.2	-2.1	-4.0	-3.2	0.3	0.8
C.O.P.D.	-2.2	-1.9	-1.0	-0.9	-1.7	-0.4	2.1	3.7*
Emergency Dept.	-15.5*	-18.1*	-9.8	-11.6*	-17.0*	-17.9*	-12.9*	-12.5*
ESWL	3.9*	5.1*	1.6	2.8*	0.5	0.9	0.8	1.0
Organ Transplant	6.9*	7.9*	3.8*	3.6*	6.2*	7.3*	-2.6	-1.0
In-Vitro Fertilization	7.9*	8.3*	5.8*	6.3*	3.6*	3.9*	7.4*	7.2*
Psych. Partial Hospital Program	-1.5	-1.2	-1.5	-1.8	-1.7	-2.5*	-2.9*	-4.1*
Diagnostic Radioisotope	-1.0	-1.8	1.4	0.6	1.5	0.2	3.3	2.4
Waivered State	-18.5*	-32.1*	-11.7*	-25.1*	-10.1*	-15.0*	-4.7*	-5.8
Adjusted R^2	18.7	20.9	12.7	15.9	11.6	12.8	9.6	10.6
N	4,648	3,936	4,648	3,936	4,159	3,529	4,159	3,529

*Statistically significant at 5% or better level.

[a] Value is an elasticity, indicating the percentage change in cost per discharge discharge arising from a 1% change in the variable.
[b] Compared to West North Central.
[c] Compared to Pacific.
[d] Compared to Rural.
[e] Compared to less than 100 beds.
[f] Compared to private nonprofit.
[g] Compared to non-teaching.

Note: Based on logarithmic regression equations weighted by hospital discharges. MCR = Medicare Cost Reports; AHA = American Hospital Association.

Source: 1989 Medicare Cost Reports and American Hospital Association Survey.

5.4 Conclusions

Among the variables we analyzed, the ones that are most strongly related to hospital nonlabor cost per discharge are hospital casemix, major teaching status, and urbanicity. Because these three factors are related to intensity of care more than to expected input price differences, variation in cost per discharge appears to be dominated by input quantity differences more than by input price differences. The policy implications of the results of this chapter must be interpreted in that light. At best, residual variation after controlling for these factors might primarily reflect price variation, although intra-DRG intensity differences are also probably reflected.

After controlling for other variables, there is significant regional and urban-rural variation in cost per discharge, which could be justification for a geographic PPS payment adjustment. Holding other policy variables constant, the PPS area wage index is correlated with nonlabor cost per discharge. This could provide the basis for a wage-index-based PPS nonlabor cost adjustment. However, the incremental power of the wage index in explaining nonlabor cost per discharge is relatively small, smaller than geographic indicators alone. Moreover, even after controlling for the wage index, systematic variation in cost per discharge remains, some of which is correlated with our partial measure of nonlabor input prices. As might be expected, these findings suggest that the PPS wage index is not the ideal adjustment factor for nonlabor cost variation.

6.0 SURVEY OF HOSPITALS FOR NONLABOR INPUT PRICES

Earlier in this report, secondary price data and hospital nonlabor expenditure (cost) measures were assessed. We also constructed and analyzed hospital nonlabor expenditure (cost) measures from 1989 Medicare Cost Report data and American Hospital Association 1989 Annual Survey of Hospitals data. We concluded that geographic adjustments to the nonlabor standardized amount could not be based on either type of data.

The inadequacy of currently available data for adjusting the nonlabor portion of the PPS market basket suggests that better data should be collected if HCFA wants to geographically adjust the nonlabor portion. A primary survey of hospitals was considered but not undertaken because of its complexity and expense. This chapter reviews these issues and provides a cost estimate to obtain the requisite price data. Even though HCFA might actually conduct such a survey itself, the discussion assumes that a contractor would conduct the survey and analyze the data. Exhibit 6-1 shows the major features of the survey that need to be considered: (1) design issues, (2) fielding of the survey, (3) quality assurance, and (4) data analysis. Each of these is discussed below.

6.1 Design Issues

The major design issues are: (1) hospital market basket, (2) sample selection, and (3) questionnaire layout. Before fielding the main survey, pilot surveys should be undertaken to test the validity of the survey instrument and improve its design.

6.1.1 Market Basket

The construction of the market basket entails two major problems. One problem is specifying the items that belong in the market basket and the principal categories into which they are classified. The second problem is the assignment of market shares to both the principal categories and to the individual items within each category. The specification of the market basket is so important that if done incorrectly, data from survey could be of little

EXHIBIT 6-1
PRIMARY SURVEY OF HOSPITALS: NONLABOR INPUT PRICES

I. DESIGN ISSUES

  A. Hospital Market Basket

  B. Hospital Sample

  C. Questionnaire Layout

  D. Pilot Surveys

II. FIELDING OF SURVEY

  A. Survey Mode

  B. Initial Contact

  C. Follow-Up Contact

  D. Survey Assistance Hotline

III. QUALITY ASSURANCE

  A. Data Entry

  B. Post-Entry Data Screening

  C. Data Audits

IV. DATA ANALYSIS

  A. Data Quality Assessment

  B. Biased Response Analysis

  C. Construction of Nonlabor Index and Sub-Indexes use in constructing a geographic nonlabor input price index. The major input categories used by HCFA in the PPS market basket and their associated expenditure shares could be used to define the principal nonlabor categories (see Table 1-1). This would still leave, however, the formidable task of specifying the representative inputs for each principal category and their expenditure shares within category.

Specifying the items that belong in the market basket entails selecting representative inputs from among the thousands of medical supplies (IMS America's Hospital Supply Index is based on approximately 2,500 sub-categories), pharmaceuticals, food items, chemicals, medical instruments, and other supplies consumed by hospitals. Among the major IMS subcategories of medical supplies are bandages and dressings, catheters, gloves, syringes and needles, chemicals and soaps, and X-ray supplies. Assuming that the principal categories listed in Table 1-1 would be used, it would be necessary to confer with HCFA representatives to ascertain the content of each of Table 1-1's categories to ensure consistent results. That is, if an item is placed in the incorrect category, its price may be under- or over-represented in an index.

Within the pharmaceutical category there are also thousands of drugs and other ethical preparations used in hospitals. The Joint Purchasing Corporation (JPC), a marketing services firm, has 27 pharmaceutical sub-categories; among them are antibiotics, gastrointestinal drugs, spasmolytics, and IV solutions.

Other principal nonlabor input categories such as food and office supplies also have sub-categories (energy and utilities sub-categories are indicated in Table 1-1). For instance, in addition to food directly prepared by hospitals, food services are often provided by catering organizations. Office supply subcategories include office papers, envelopes, writing instruments, copier supplies, business forms, data binders, paper clips, janitorial supplies, and address books and personal organizers.

Given the large number of types of medical supplies, pharmaceuticals, and office supplies, it is quite likely that hospitals, especially large hospitals, purchase 5-10 thousand types of nonlabor inputs. This raises the issue of how many inputs should be covered in the survey. The more inputs included the survey, the higher the accuracy of the nonlabor price index. The reporting burden on hospitals, however, would increase as the number of inputs surveyed increases. It does not seem possible to survey fewer than 200 items. Two hundred inputs represents less than five percent of all nonlabor inputs. However, if the selected inputs included only the highest expenditure items, 200 inputs might be adequate. Surveying more than 200 inputs would probably put an intolerable reporting burden on hospitals.

The IMS America Hospital Supply Index and pharmaceutical databases can be used to identify the supplies and drugs with the highest hospital expenditures. These inputs would be included in the hospital survey along with a random sample of lower-expenditure items. The IMS data could also provide expenditure shares for each medical supply or pharmaceutical surveyed. While hospitals could provide total annual expenditures for each input in response to a survey, to do so would require hospitals to compile their records to determine the amount. Additionally, total expenditures on unsurveyed inputs would be needed so market shares can be calculated. This would impose a high reporting burden which could cause hospitals to not cooperate with the survey. The IMS data would cost at least 400 thousand dollars but would facilitate the construction of expenditure shares and greatly reduce the reporting burden on hospitals.

Once representative medical supplies, office supplies, food products, pharmaceuticals, et cetera, were specified, it would be necessary to obtain information on their unit prices through a survey of hospitals. (Note that the chosen inputs should have the same geographic price variation as other inputs in their classes. However, it might not be possible to determine, ex ante, whether the inputs have the same price variation.) To obtain the relevant unit prices for each input, it would also be necessary to specify the characteristics of the input. For instance, IMS classifies bandages as 2-ply or 6-ply while non-adherent dressings may be non-medicated wet, medicated wet, or dry. The IMS diagnostic and therapeutic catheter sub-category is further divided into diagnostic angiographic catheters, radiology catheters, and therapeutic catheters.[1] Among pharmaceuticals, once a drug has been selected, dosage, package size, method of administration (that is, active agent in pill form, liquid form, or added to IV solution), and manufacturer all must be specified. (Use of National Drug Codes (NDC) can help reduce the incidence of incorrect responses since the NDC codes embody dosage and method of administration.) It would also be necessary to decide whether to specify a generic drug (if available) instead of a branded drug.

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[1] The diagnostic and therapeutic catheter category includes, at least, four other categories at the same level as those mentioned in the text. Additionally, each of these major sub-categories has two or more sub-categories, some of which also have their own sub-categories.

Specification of the 200 items would be a difficult and time-consuming process. Not only would it be necessary to know the characteristics or attributes of the items being surveyed, it also would be necessary to know attributes of similar items. To help specify the inputs which should be included in a survey, a panel of experts should be convened, including representatives of hospital purchasing directors, hospital associations, and distributors of medical supplies. The panel would not only help determine which inputs should be included in the survey, but also could provide price ranges against which to judge individual item price responses.

6.1.2 Hospital Sample

The size of the necessary survey sample should depend on the expected number of geographic markets for nonlabor inputs. This section reviews theoretical considerations about market size and concludes that a census of hospitals is necessary to construct an accurate and equitable nonlabor price index.

Market areas, according to economic theory, should be defined as the smallest area where locational price variation does not exist. The type of commodity that is traded also influences market boundaries. Durable goods, for instance, can be easily transported from one area to another if prices in each area diverge too much from each other. For durable goods, there are several potential sources of geographic price variation. First, shipping costs from manufacturers to distributor and hospitals may vary geographically. Second, manufacturers might geographically price discriminate, charging different prices for the same item to distributors in different parts of the country, in addition to shipping costs and volume discounts.[2] Third, distributors' costs of doing business might vary geographically. And fourth, the degree of competition between local distributors might affect the markup charged to hospitals. As noted in Chapter 2, anecdotal evidence suggests that the market for medical supplies and pharmaceuticals are national. The impact of distributors' local cost of business and/or local competition among distributors is lessened by the extensive participation of hospitals in regional or national buying groups (e.g., AmeriNet in St. Louis and alliances such as the VHA). Evidence on shipping costs, in aggregate, suggests that there is limited geographic variation because medical supply manufacturers are geographically dispersed (Adamache and Pope, 1993).[3] These factors argue for large market areas.

On the other hand, some nonlabor inputs, including malpractice insurance, local telephone rates, electricity, water and sewer, and perhaps natural gas, cannot be arbitraged because they cannot be traded between geographic areas. These items account for approximately fourteen percent of the hospital nonlabor market basket. ProPAC (1989) found intra-state price variation for these items and food products.

Thus, while the market for some nonlabor inputs may be regional or national, markets for other nonlabor inputs are state or local. To adequately capture geographic price variation, the market areas for a PPS nonlabor index must be smaller than states. For consistency, the nonlabor input price index could use the same basis as the PPS wage index with an index value for each MSA and for each state rural area. If MSAs were the basis of a nonlabor input price index, then all non-exempt PPS hospitals would have to be surveyed.

The expected level of voluntary cooperation by hospitals with a nonlabor price survey is low. The basis for this assessment is HCFA's experience in trying to obtain 1986 occupation-specific wage data for the PPS Area Wage Index. HCFA had to abandon the wage survey because only one-third of hospitals responded to the survey. Further, the complexity of the occupation-specific categories in the wage survey is much less than the nonlabor input categories. Thus, if hospitals were not cooperative in supplying data on occupational wages, it seems unlikely they would be more cooperative supplying nonlabor input prices. A Congressional mandate is the only way to guarantee full participation in the survey. Additionally, the cooperation and endorsement of the American Hospital Association (AHA) might induce hospitals to respond to the survey.[4]

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[2] Arbitrage (elimination of price differentials through trading between areas) may be too costly to eliminate geographic price differentials.

[3] Adamache and Pope (1993) also investigated urban/rural shipping cost differentials and could not find evidence for their existence.

Even a Congressional mandate and endorsement by the AHA would not ensure that hospitals would provide high-quality responses for each individual input, and item responses rates for each of the 200 inputs might be low. The validity of a nonlabor input index would depend on sufficient responses for each input price. Thus, substantial effort might be required to increase valid item response rates by telephone call-backs and on-site audits.

6.1.3 Questionnaire Layout

Requesting unit prices on 200 items for a nonlabor input price index would require a complex questionnaire. As discussed above, medical supplies and pharmaceuticals are typically available in many different configurations. The questionnaire might be similar to the equipment supplement of the 1988 Physicians' Practice Costs and Income Survey (PPCIS). In addition to questions about expenditures on clinical chemistry equipment, questions 61 and 62 of the PPCIS asked about attributes of the equipment. These questions indicate the complexity of the survey form layout. A variant of the PPCIS approach would be to include blank lines so that product attributes not covered by the questionnaire could be specified by the hospital. A 200-item survey would likely require a 40-page form, plus instructions.[5] Such a survey would be much more detailed and complex than the AHA's Annual Survey of Hospitals.

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[4] The survey contractor and/or HCFA would probably have to meet with AHA representatives in Chicago in the effort to secure the AHA's cooperation.

[5] The discussion in this section is based on the assumption of 200 inputs being surveyed.

6.1.4 Pilot Survey

Designing a questionnaire of the indicated complexity and size would likely result in mistakes that would not be uncovered until actual fielding of the survey. To minimize these problems, two pilot surveys should be undertaken. The first should use nine hospitals to uncover major design problems of the questionnaire and problems in assisting respondent hospitals or in processing data from the form.

Once the survey were field tested, it would be submitted for administrative review before proceeding with the second pilot survey which would assess the reliability of hospital responses. One hundred hospitals would be included in the second pilot survey. To assess the reliability of individual hospital responses, 50 of the completed surveys would be audited by an accounting firm to try to discover the cause of "outlier" responses more than 25 percent from the expected value.[6] The audit would try to ascertain the source of the errors: problems with the questionnaire or with the effort of the hospitals. Problems with the questionnaire would be rectified while problems with the hospitals could be used to help develop data screens for responses of the overall survey.

The audits themselves would be performed in the hospitals. The audit would only cover the items on the survey and would not be a standard financial audit of a hospital. Each audit would take two person-days by a junior member of the accounting firm, plus an additional person-day of upper management review. Use of a national accounting firm with nationally-distributed offices would minimize travel costs, but the cost of auditing 50 pilot surveys would likely be at least 175 thousand dollars.[7]

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[6] Some price variation is inevitable, even in national markets. The degree of price variation may be quite high, especially for low-priced items. Unless a pilot survey is undertaken, however, determining what is reasonable price variation would be quite difficult - even with the assistance of the expert panel.

[7] The daily rates for the audit were based on the assumption that the audit would be performed between May and August. Rates for the tax season (December through April) are considerably higher. Survey audits should not be conducted in September though November because the fiscal year for many hospitals ends on September 30 and normal financial audits often take place during this period.

6.2 Fielding the Survey

The length and complexity of the survey suggests it be done by mail, to the attention of hospital materials management (purchasing) departments. Four thousand follow-up phone calls of one-half hour duration each are expected for non-responders. With a Congressional mandate and intensive follow-up, 5,000 hospitals out of a universe of 5,500 might be expected to respond.

As noted above, instructions would be included with each questionnaire and an 800 number hotline could be used to provide assistance. Overall, fielding the survey would be expected to take six months.

6.3 Quality Assurance and Data Entry

Data entry would be verified through double-entry of each item, with systematic checks using minimum and maximum price guidelines provided by an expert panel to detect anomalous values. Anomalous values would be checked for valid entry and the hospital would be contacted for verification and/or correction.

Narrowing the range between acceptable minimum and maximum prices for each input and improving overall data quality could be accomplished by a five percent audit of responding hospitals. As with the pilot survey, the audit would be performed by a national accounting firm with an estimated cost of 700 thousand dollars for 250 hospitals.

6.4 Data Analysis and Construction of Nonlabor Input Price Index

The first data analysis would be an analysis of item responses to determine whether enough hospitals responded to construct a nonlabor input price index. An analysis of biased response should be undertaken. The purpose of biased response analysis would be to determine whether certain hospital types (e.g., small hospitals) are over- or under-represented among the respondents. Statistical adjustments could be made to the data if such biases were found. The biased response analysis would be performed at two levels: the overall hospital and individual inputs, since not all hospitals would respond to all items.

Assuming the survey data is of sufficient quality, nonlabor input price index(es) could be constructed. Indexes for each nonlabor input category as well as a nationally-weighted overall index could be constructed. Analysis of the redistribution of PPS payments could be undertaken to determine which areas would gain or lose from the index. The analysis would include an assessment of the impact of the redistribution of PPS payments on the profitability of hospitals, using data from AHA annual surveys and Medicare Cost Reports.

6.5 Expert Panel Role

Tasks to be performed by an expert panel have been mentioned in this chapter. The expert panel would have several important tasks. First, they would help select representative inputs. Second, they would help determine what attributes or characteristics of inputs need to be accounted for. Third, panel members would provide expected minimum and maximum prices for each input. These prices would constitute the initial data screens for quality assurance. Fourth, to the extent hospitals supply the price and attributes of a similar input instead of the requested input, the panel would estimate "conversion" factors so the response would not have to be discarded. Fifth, panel members would help assess the results of the second pilot survey. Sixth, the panels members would meet with the survey contractor to review the quality of the data obtained from the full survey. This last meeting would be held after the biased response analysis but before the analysis of winners and losers.

Panel members would attend four meetings. The first meeting (one day) would be held during the first month of the project and would review project objectives and assign tasks to members. The second meeting (three days) would be held three months later. Its objective would be final selection of inputs for the survey, specification of input attributes, and acceptable minimum and maximum unit prices. The third meeting would assess the quality of data obtained in the second pilot survey and, if necessary, provide input on modifications to the survey instrument. Fourth, as mentioned above, the last meeting would be held prior to the analysis of the distributional effects of the index. The panel would have five members, each devoting 20 days to the project.

6.6 Summary

Expected problems in conducting the survey are summarized in this section and the overall timeframe and cost of the survey are outlined. The selection of representative inputs for the market basket from among the thousands of items purchased by hospitals would be a difficult task. Design of the content (questions) of the survey would require careful planning to account for the many possible variants of each input. It is likely that hospitals would resist completing the survey and considerable resources could be required to secure compliance. Item response rates might be low with frequent call-backs necessary. The reliability of the responses for individual inputs could be quite low and addressing this problem could require costly on-site audits and considerable adjustments to the data. Even after considerable effort and expense, random errors in the data might exceed the extent of geographic variation in input prices (which could be 10 percent or less). Also, there is no guarantee that price variation in the sample of nonlabor input prices surveyed would accurately represent price variation in all nonlabor inputs.

The project would be expected to take 26 months. Selection of representative inputs, survey design, and the first pilot survey would require six months. Then six months would be allowed for administrative approval to proceed. The second pilot survey and its audit would take three months. The main survey would take six months (data entry and audits by the accounting firm would occur periodically during this six month period).[8] Data analysis and the draft final report would take four months. The final month would be for HCFA's review of the draft final.

The anticipated cost of the survey (including audits) and data analysis would be 2.8 million dollars (Exhibit 6-2). While we regard this as a reasonable estimate, it could be an underestimate for many reasons. For instance, as discussed above, if the audits do not take

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[8] It might not be possible to have audits performed during this six month period, resulting in additional delays.

EXHIBIT 6-2
PROJECTED SURVEY BUDGET

DIRECT LABOR	SURVEY DESIGN	SURVEY IMPLEMENTATION	ANALYSIS	TOTAL DAYS	AMOUNT
PROJECT DIRECTOR	10	5	10	25	$9,000.00
SENIOR ANALYSTS	80	55	110	245	$66,000.00
ANALYSTS	80	1300	65	1445	$222,000.00
RESEARCH ASSISTANT	40	42	30	112	$12,000.00
PROGRAMMER	35	20	70	125	$20,000.00
SECRETARY	40	50	30	120	$13,000.00
	SUBTOTAL LABOR				$342,000.00
	FRINGE & OVERHEAD				$260,000.00
	SUBTOTAL LABOR				$602,000.00
OTHER COSTS					
Computer					$10,000.00
IMS Market Share Data					$400,000.00
AHA Annual Survey					$6,000.00
Travel					$5,000.00
Phone					$1,000.00
Phone survey: 2,000 long distance hours					$29,000.00
800 Phone Line					$11,000.00
Duplication					$1,000.00
Postage					$1,000.00
Data Entry					$50,000.00
Consultants					$91,000.00
Survey Supplies					$94,000.00
Subcontractors – Pilot Survey Audit					$172,000.00
Subcontractors – Main Survey Audit					$702,000.00
	SUBTOTAL OTHER COSTS				$1,573,000.00
SUBTOTAL LABOR/OTHER					$2,175,000.00
	G & A				$337,000.00
	SUBTOTAL COSTS				$2,512,000.00
	FEE				$251,000.00
	TOTAL COSTS				$2,763,000.00

place during the slack period for accounting firms, audit costs would be considerably higher. Obtaining valid responses from a sufficient number of hospitals to construct an index could also be more costly than budgeted. Thus, the survey could cost as much as 3.5 million dollars.

Because of rapid technological change in pharmaceuticals and medical supplies, a nonlabor input price survey would need frequent updating, but it does not seem feasible to conduct this survey annually. Because of technological change, representative inputs and their attributes would require review before each new survey and market basket turnover, market basket shares would have to be updated (along with the associated costs of obtaining IMS data). Assuming that successive surveys and the analysis of the data would take more than 12 months, the survey should be conducted every two or three years. Elimination of the audits on successive surveys should reduce the survey cost by about one million dollars. Some savings should also result from reduced staff requirements for successive surveys as hospitals responded in a more timely fashion to the survey and fewer follow-up calls were required.

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APPENDIX A

LIST OF ORGANIZATIONS CONTACTED ABOUT HOSPITAL NONLABOR INPUT PRICES AND EXPENDITURES

APPENDIX A

LIST OF ORGANIZATIONS CONTACTED ABOUT HOSPITAL NONLABOR INPUT PRICES AND EXPENDITURES

A.M. Best Company

American Chamber of Commerce Association
 –Subscription Office

American Health Care System
 –San Diego, CA

American Hospital Association
 –American Society for Hospital Materials Management
 –Market Basket Group

American Insurance Association

AmeriNet

Bureau of Census
 –Statistical Reference

Carecor Health Services, Inc.
 –Toronto, Canada

Center on Budget and Policy Priorities

Department of Agriculture
 –National Agricultural Library

Department of Energy
 –Government Printing Office

Department of Labor
 –Bureau of Labor Statistics
 –Employment Costs Division

Federal Communications Commission
 –Industry Analysis Division

Government Accounting Office
 –Documents
 –Public Information

Health and Human Services
 –Agency for Health Care Policy & Research
 –Division of Quality Assurance
 –Health Resources
 –Manpower
 –Public Health Service

Health Association of New York

Hospital Materials Management

Hospital Purchasing News

Human Nutrition Research Center

IMS America, Ltd.

Joint Purchasing Corporation
 –New York, NY

Kentucky Chamber of Commerce

Market Intelligence Research Corporation
 –California

McFaul-Lyons
 –Trenton, NJ

McKnight Medical Communications
 –Chicago, IL

National Institute of Health
 –Public Relations

St. Pauls Fire & Marine Ins. Co.
 –St. Paul, MN

United States Department of Agriculture

University of Chicago

U.S. Bureau of Labor Statistics
 –Producer Price Index

Voluntary Hospitals of America
 –Irving, TX

APPENDIX B

FACSIMILE OF WORKSHEETS A AND B (PART I) OF THE MEDICARE COST REPORT

COST ALLOCATION - GENERAL SERVICE COSTS	PROVIDER NO:	PERIOD: FROM ____________ TO ____________	WORKSHEET A

	COST CENTER DESCRIPTIONS (omit cents)	SALARIES 1	OTHER 2	TOTAL 3	RECLASSIFICATIONS 4	RECLASSIFIED TRIAL BALANCE 5	ADJUSTMENTS 6	NET EXPENSES FOR ALLOCATION 7	
	GENERAL SERVICE COST CENTERS								
1	Capital Related Costs--Buildings and Fixtures		E90						1
2	Capital Related Costs--Movable Equipment		E91						2
3	Employee Benefits		BENEFITS						3
4	Administrative and General								4
5	Maintenance and Repairs								5
6	Operation of Plant								6
7	Laundry and Linen Service								7
8	Housekeeping								8
9	Dietary							E129	9
10	Cafeteria								10
11	Maintenance of Personnel	E92	E102						11
12	Nursing Administration								12
13	Central Services and Supply								13
14	Pharmacy								14
15	Medical Records and Library								15
16	Social Service								16
17									17
18									18
19	Nonphysician Anesthetists								19
20	Nursing School								20
21	Intern - Res. Service -- Salary and Fringes (Apprvd)	E93							21
22	Intern-Res. Other Program Costs (Apprvd)		E103						22
23	Paramedical Ed. Program (Specify)								23
24	Paramedical Ed. Program (Specify)								24
	INPATIENT ROUTINE SERVICE COST CENTERS								
25	Adults and Pediatrics (General Routine Care)								25
26	Intensive Care Unit								26
27	Coronary Care Unit	E94	E104						27
28								E130	28
29									29
30									30
31	Subprovider I								31
32	Subprovider II								32
33	Nursery								33
34	Skilled Nursing Facility								34
35	Intermediate Care Facility								35

FORM HCFA-2552-89 (12/89) (INSTRUCTIONS FOR THIS WORKSHEET ARE PUBLISHED IN HCFA PUB. 15-II, SEC. 2407)

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO: __________

PERIOD:
FROM __________
TO __________

WORKSHEET A

	COST CENTER DESCRIPTIONS (omit cents)	SALARIES 1	OTHER 2	TOTAL 3	RECLASSIFICATIONS 4	RECLASSIFIED TRIAL BALANCE 5	ADJUSTMENTS 6	NET EXPENSES FOR ALLOCATION 7	
36	Other Long Term Care								36
	ANCILLARY SERVICE COST CENTERS								
37	Operating Room								37
38	Recovery Room								38
39	Delivery Room and Labor Room								39
40	Anesthesiology								40
41	Radiology--Diagnostic								41
42	Radiology--Therapeutic								42
43	Radioisotope								43
44	Laboratory								44
45	PBP Clinical Lab Svcs--Prgm Only								45
46	Whole Blood & Packed Red Blood Cells	E96	E106					E132	46
47	Blood Storing, Processing & Trans.								47
48	Intravenous Therapy								48
49	Respiratory Therapy								49
50	Physical Therapy								50
51	Occupational Therapy								51
52	Speech Pathology								52
53	Electrocardiology								53
54	Electroencephalography								54
55	Medical Supplies Charged to Patients								55
56	Drugs Charged to Patients								56
57	Renal Dialysis								57
58	ASC (Non-Distinct Part)								58
59									59
	OUTPATIENT SERVICE COST CENTERS								
60	Clinic								60
61	Emergency								61
62	Observation Beds								62
	OTHER REIMBURSABLE COST CENTERS								
63	Home Program Dialysis								63
64	Ambulance Services								64
65	Durable Medical Equipment--Rented								65
66	Durable Medical Equipment--Sold								66
67									67
68									68

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO:

PERIOD:
FROM ______________
TO ______________

WORKSHEET A

	COST CENTER DESCRIPTIONS (omit cents)	SALARIES 1	OTHER 2	TOTAL 3	RECLASSIFICATIONS 4	RECLASSIFIED TRIAL BALANCE 5	ADJUSTMENTS 6	NET EXPENSES FOR ALLOCATION 7	
69	Home Program Dialysis Equipment--100% Medicare								69
70	Intern-Resident Service (Not Apprvd Tchng Program)								70
71	Administrative and General--HHA								71
72	Skilled Nursing Care--HHA								72
73	Physical Therapy--HHA								73
74	Occupational Therapy--HHA								74
75	Speech Pathology--HHA								75
76	Medical Social Services--HHA								76
77	Home Health Aide--HHA								77
78	DME-Rented--HHA								78
79	DME-Sold--HHA								79
80	Home Delivered Meals--HHA								80
81	Other Home Health Services--HHA								81
82	CORF								82
	SPECIAL PURPOSE COST CENTERS								
83	Kidney Acquisition								83
84	Liver Acquisition								84
84A	Heart Acquisition								84A
85	Other Organ Acquisition								85
86	Malpractice Premiums and Paid Losses							-0-	86
87	Interest Expense							-0-	87
88	Utilization Review--SNF							-0-	88
89	Skilled Nursing (Respite)--HHA								89
90	Home Health Aide/Homemaker (Respite)--HHA								90
91	Ambulatory Surgical Center (Distinct Part)								91
92	Hospice								92
93									93
94									94
95	SUBTOTALS								95
	NONREIMBURSABLE COST CENTERS								
96	Gift, Flower, Coffee Shop & Canteen								96
97	Research								97
98	Physicians' Private Offices								98
99	Nonpaid Workers								99
100									100
101	TOTAL				-0-				101

FORM HCFA-2552-89 (12/89) (INSTRUCTIONS FOR THIS WORKSHEET ARE PUBLISHED IN HCFA PUB. 15-II, SEC. 2407)

COST ALLOCATION - GENERAL SERVICE COSTS	PROVIDER NO:	PERIOD: FROM TO	WORKSHEET B PART I

	COST CENTER DESCRIPTIONS	NET EXPENSES FOR COST ALLOCATION (FR WKST A, COL 7) 0	CAPITAL RELATED COST BLDGS & FIXTURES 1	CAPITAL RELATED COST MOVABLE EQUIPMENT 2	EMPLOYEE BENEFITS 3	SUBTOTAL (COLS 0-3) 3a	ADMINIS-TRATIVE & GENERAL 4	MAIN-TENANCE & REPAIRS 5	OPERATION OF PLANT 6	LAUNDRY & LINEN SERVICE 7	HOUSE-KEEPING 8	
	GENERAL SERVICE COST CENTERS											
1	Capital Related Costs--Buildings and Fixtures	F129										1
2	Capital Related Costs--Movable Equipment											2
3	Employee Benefits											3
4	Administrative and General											4
5	Maintenance and Repairs											5
6	Operation of Plant											6
7	Laundry and Linen Service											7
8	Housekeeping											8
9	Dietary											9
10	Cafeteria											10
11	Maintenance of Personnel											11
12	Nursing Administration											12
13	Central Services and Supply											13
14	Pharmacy											14
15	Medical Records and Library											15
16	Social Service											16
17												17
18												18
19	Nonphysician Anesthetists											19
20	Nursing School											20
21	Intern & Res. -- Salary and Fringes (Appvd)											21
22	Intern Res. Other Program Costs (Appvd)											22
23	Paramedical Ed. Program (Specify)											23
24	Paramedical Ed. Program (Specify)											24
	INPATIENT ROUTINE SERVICE COST CENTERS											
25	Adults and Pediatrics (General Routine Care)	F130										25
26	Intensive Care Unit											26
27	Coronary Care Unit											27
28												28
29												29
30												30
31	Subprovider I											31
32	Subprovider II											32
33	Nursery											33
34	Skilled Nursing Facility											34

FORM HCFA-2552-89(12/89) (INSTRUCTIONS FOR THIS WORKSHEET ARE PUBLISHED IN HCFA PUB. 15-II, SEC. 2411)

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO:

PERIOD:
FROM ____________
TO ____________

WORKSHEET B
PART I (CONT.)

	COST CENTER DESCRIPTIONS	NET EXPENSES FOR COST ALLOCATION (FR WKST A, COL. 7) 0	CAPITAL RELATED COST BLDGS & FIXTURES 1	CAPITAL RELATED COST MOVABLE EQUIPMENT 2	EMPLOYEE BENEFITS 3	SUBTOTAL (COLS 0-3) 3a	ADMINIS-TRATIVE & GENERAL 4	MAIN-TENANCE & REPAIRS 5	OPERATION OF PLANT 6	LAUNDRY & LINEN SERVICE 7	HOUSE-KEEPING 8	
35	Intermediate Care Facility											35
36	Other Long Term Care											36
	ANCILLARY SERVICE COST CENTERS											
37	Operating Room											37
38	Recovery Room											38
39	Delivery Room and Labor Room											39
40	Anesthesiology											40
41	Radiology--Diagnostic											41
42	Radiology--Therapeutic											42
43	Radioisotope											43
44	Laboratory											44
45	PBP Clinical Lab Svce--Prgm Only											45
46	Whole Blood & Packed Red Blood Cells	F132										46
47	Blood Storing, Processing & Trans.											47
48	Intravenous Therapy											48
49	Respiratory Therapy											49
50	Physical Therapy											50
51	Occupational Therapy											51
52	Speech Pathology											52
53	Electrocardiology											53
54	Electroencephalography											54
55	Medical Supplies Charged to Patients											55
56	Drugs Charged to Patients											56
57	Renal Dialysis											57
58	Ambulatory Surgical Center (Non-Distinct Part)											58
59												59
	OUTPATIENT SERVICE COST CENTERS											
60	Clinic											60
61	Emergency											61
62	Observation Beds											62
	OTHER REIMBURSABLE COST CENTERS											
63	Home Program Dialysis											63
64	Ambulance Services											64
65	Durable Medical Equipment--Rented											65
66	Durable Medical Equipment--Sold											66
67												67
68												68

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO:

PERIOD:
FROM ______________
TO ______________

WORKSHEET B
PART I (CONT.)

	COST CENTER DESCRIPTIONS	NET EXPENSES FOR COST ALLOCATION (FR WKST A, COL. 7) 0	CAPITAL RELATED COST BLDGS & FIXTURES 1	CAPITAL RELATED COST MOVABLE EQUIPMENT 2	EMPLOYEE BENEFITS 3	SUBTOTAL (COLS 0-3) 3a	ADMINIS-TRATIVE & GENERAL 4	MAIN-TENANCE & REPAIRS 5	OPERATION OF PLANT 6	LAUNDRY & LINEN SERVICE 7	HOUSE-KEEPING 8	
	OUTPATIENT SERVICE COST CENTERS											
69	Home Program Dialysis Equipment--100% Medicare											69
70	Intern-Resident Service (Not Appvd Tchng Program)											70
71	Administrative and General--HHA											71
72	Skilled Nursing Care--HHA											72
73	Physical Therapy--HHA											73
74	Occupational Therapy--HHA											74
75	Speech Pathology--HHA											75
76	Medical Social Services--HHA											76
77	Home Health Aide--HHA											77
78	DME-Rented--HHA											78
79	DME-Sold--HHA											79
80	Home Delivered Meals--HHA											80
81	Other Home Health Services--HHA											81
82	CORF											82
	SPECIAL PURPOSE COST CENTERS											
83	Kidney Acquisition											83
84	Liver Acquisition											84
84A	Heart Acquisition											84A
85	Other Organ Acquisition											85
89	Skilled Nursing (Respite)--HHA											89
90	Home Health Aide/Homemaker (Respite)--HHA											90
91	Ambulatory Surgical Center (Distinct Part)											91
92	Hospice											92
93												93
94												94
95	SUBTOTALS											95
	NONREIMBURSABLE COST CENTERS											
96	Gift, Flower, Coffee Shop & Canteen											96
97	Research											97
98	Physicians' Private Offices											98
99	Nonpaid Workers											99
100												100
101	Cross Foot Adjustments											101
102	Negative Cost Centers											102
103	TOTAL	F138										103

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO:

PERIOD:
FROM ____________
TO ____________

WORKSHEET B
PART I (CONT.)

	COST CENTER DESCRIPTIONS	DIETARY 9	CAFETERIA 10	MAINTENANCE OF PERSONNEL 11	NURSING ADMINISTRATION 12	CENTRAL SERVICES & SUPPLY 13	PHARMACY 14	MEDICAL RECORDS & LIBRARY 15	SOCIAL SERVICE 16	17	18	
	GENERAL SERVICE COST CENTERS											
1	Capital Related Costs--Buildings and Fixtures											1
2	Capital Related Costs--Movable Equipment											2
3	Employee Benefits											3
4	Administrative and General											4
5	Maintenance and Repairs											5
6	Operation of Plant											6
7	Laundry and Linen Service											7
8	Housekeeping											8
9	Dietary											9
10	Cafeteria											10
11	Maintenance of Personnel											11
12	Nursing Administration											12
13	Central Services and Supply											13
14	Pharmacy											14
15	Medical Records and Library											15
16	Social Service											16
17												17
18												18
19	Nonphysician Anesthetists											19
20	Nursing School											20
21	Intern & Res. -- Salary and Fringes (Apprvd)											21
22	Intern-Res. Other Program Costs (Apprvd)											22
23	Paramedical Ed. Program (Specify)											23
24	Paramedical Ed. Program (Specify)											24
	INPATIENT ROUTINE SERVICE COST CENTERS											
25	Adults and Pediatrics (General Routine Care)											25
26	Intensive Care Unit											26
27	Coronary Care Unit											27
28												28
29												29
30												30
31	Subprovider I											31
32	Subprovider II											32
33	Nursery											33
34	Skilled Nursing Facility											34

COST ALLOCATION - GENERAL SERVICE COSTS		PROVIDER NO:	PERIOD: FROM __________ TO __________	WORKSHEET B PART I (CONT.)

	COST CENTER DESCRIPTIONS	DIETARY 9	CAFETERIA 10	MAIN-TENANCE OF PERSONNEL 11	NURSING ADMINIS-TRATION 12	CENTRAL SERVICES & SUPPLY 13	PHARMACY 14	MEDICAL RECORDS & LIBRARY 15	SOCIAL SERVICE 16	17	18	
35	Intermediate Care Facility											35
36	Other Long Term Care											36
	ANCILLARY SERVICE COST CENTERS											
37	Operating Room											37
38	Recovery Room											38
39	Delivery Room and Labor Room											39
40	Anesthesiology											40
41	Radiology--Diagnostic											41
42	Radiology--Therapeutic											42
43	Radioisotope											43
44	Laboratory											44
45	PBP Clinical Lab Srvc--Prgm Only											45
46	Whole Blood & Packed Red Blood Cells											46
47	Blood Storing, Processing & Trans.											47
48	Intravenous Therapy											48
49	Respiratory Therapy											49
50	Physical Therapy											50
51	Occupational Therapy											51
52	Speech Pathology											52
53	Electrocardiology											53
54	Electroencephalography											54
55	Medical Supplies Charged to Patients											55
56	Drugs Charged to Patients											56
57	Renal Dialysis											57
58	Ambulatory Surgical Center (Non-Distinct Part)											58
59												59
	OUTPATIENT SERVICE COST CENTERS											
60	Clinic											60
61	Emergency											61
62	Observation Beds											62
	OTHER REIMBURSABLE COST CENTERS											
63	Home Program Dialysis											63
64	Ambulance Services											64
65	Durable Medical Equipment--Rented											65
66	Durable Medical Equipment--Sold											66
67												67
68												68

COST ALLOCATION - GENERAL SERVICE COSTS

PROVIDER NO:

PERIOD:
FROM ______________
TO ______________

WORKSHEET B
PART I (CONT.)

	COST CENTER DESCRIPTIONS	DIETARY 9	CAFETERIA 10	MAINTENANCE OF PERSONNEL 11	NURSING ADMINISTRATION 12	CENTRAL SERVICES & SUPPLY 13	PHARMACY 14	MEDICAL RECORDS & LIBRARY 15	SOCIAL SERVICE 16	17	18	
	OUTPATIENT SERVICE COST CENTERS											
69	Home Program Dialysis Equipment--100% Medicare											69
70	Intern-Resident Service (Not Apprvd Tchng Program)											70
71	Administrative and General--HHA											71
72	Skilled Nursing Care--HHA											72
73	Physical Therapy--HHA											73
74	Occupational Therapy--HHA											74
75	Speech Pathology--HHA											75
76	Medical Social Services--HHA											76
77	Home Health Aide--HHA											77
78	DME-Rented--HHA											78
79	DME-Sold--HHA											79
80	Home Delivered Meals--HHA											80
81	Other Home Health Services--HHA											81
82	CORF											82
	SPECIAL PURPOSE COST CENTERS											
83	Kidney Acquisition											83
84	Liver Acquisition											84
84A	Heart Acquisition											84A
85	Other Organ Acquisition											85
89	Skilled Nursing (Respite)--HHA											89
90	Home Health Aide/Homemaker (Respite)--HHA											90
91	Ambulatory Surgical Center (Distinct Part)											91
92	Hospice											92
93												93
94												94
95	SUBTOTALS											95
	NONREIMBURSABLE COST CENTERS											
96	Gift, Flower, Coffee Shop & Canteen											96
97	Research											97
98	Physicians' Private Offices											98
99	Nonpaid Workers											99
100												100
101	Cross Foot Adjustments											101
102	Negative Cost Centers											102
103	TOTAL											103

COST ALLOCATION - GENERAL SERVICE COSTS	PROVIDER NO:	PERIOD: FROM ______ TO ______	WORKSHEET B PART I (CONT.)

	COST CENTER DESCRIPTIONS	NONPHYSICIAN ANESTHETISTS 19	NURSING SCHOOL 20	INTERNS & RESIDENTS SALARY AND FRINGES 21	INTERNS & RESIDENTS PROGRAM COSTS 22	PARAMEDICAL EDUCATION (SPECIFY) 23	PARAMEDICAL EDUCATION (SPECIFY) 24	SUBTOTAL 25	POST STEPDOWN ADJUSTMENTS 26	TOTAL 27	
	GENERAL SERVICE COST CENTERS										
1	Capital Related Costs--Buildings and Fixtures										1
2	Capital Related Costs--Movable Equipment										2
3	Employee Benefits										3
4	Administrative and General										4
5	Maintenance and Repairs										5
6	Operation of Plant										6
7	Laundry and Linen Service										7
8	Housekeeping										8
9	Dietary										9
10	Cafeteria										10
11	Maintenance of Personnel										11
12	Nursing Administration										12
13	Central Services and Supply										13
14	Pharmacy										14
15	Medical Records and Library										15
16	Social Service										16
17											17
18											18
19	Nonphysician Anesthetists										19
20	Nursing School										20
21	Intern & Res. -- Salary and Fringes (Apprvd)										21
22	Intern-Res. Other Program Costs (Apprvd)										22
23	Paramedical Ed. Program (Specify)										23
24	Paramedical Ed. Program (Specify)										24
	INPATIENT ROUTINE SERVICE COST CENTERS										
25	Adults and Pediatrics (General Routine Care)									E222	25
26	Intensive Care Unit									E223	26
27	Coronary Care Unit									E224	27
28											28
29										E225	29
30											30
31	Subprovider I										31
32	Subprovider II										32
33	Nursery										33
34	Skilled Nursing Facility										34

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COST ALLOCATION - GENERAL SERVICE COSTS	PROVIDER NO:	PERIOD: FROM ____ TO ____	WORKSHEET B PART I (CONT.)

	COST CENTER DESCRIPTIONS	NONPHYSICIAN ANESTHETISTS 19	NURSING SCHOOL 20	INTERNS RESIDENTS SALARY AND FRINGES 21	INTERNS RESIDENTS PROGRAM COSTS 22	PARAMEDICAL EDUCATION (SPECIFY) 23	PARAMEDICAL EDUCATION (SPECIFY) 24	SUBTOTAL 25	POST STEPDOWN ADJUSTMENTS 26	TOTAL 27	
35	Intermediate Care Facility										35
36	Other Long Term Care										36
	ANCILLARY SERVICE COST CENTERS										
37	Operating Room									F231	37
38	Recovery Room									F232	38
39	Delivery Room and Labor Room									F233	39
40	Anesthesiology									F234	40
41	Radiology--Diagnostic									F235	41
42	Radiology--Therapeutic									F236	42
43	Radioisotope									F237	43
44	Laboratory									F238	44
45	PBP Clinical Lab Svcs--Prgm Only									F239	45
46	Whole Blood & Packed Red Blood Cells									F240	46
47	Blood Storing, Processing & Trans.									F241	47
48	Intravenous Therapy									F242	48
49	Respiratory Therapy									F243	49
50	Physical Therapy									F245	50
51	Occupational Therapy									F247	51
52	Speech Pathology									F248	52
53	Electrocardiology									F249	53
54	Electroencephalography									F250	54
55	Medical Supplies Charged to Patients									F251	55
56	Drugs Charged to Patients									F252	56
57	Renal Dialysis									F253	57
58	Ambulatory Surgical Center (Non-Distinct Part)									F254	58
59											59
	OUTPATIENT SERVICE COST CENTERS										
60	Clinic										60
61	Emergency										61
62	Observation Beds										62
	OTHER REIMBURSABLE COST CENTERS										
63	Home Program Dialysis										63
64	Ambulance Services										64
65	Durable Medical Equipment--Rented										65
66	Durable Medical Equipment--Sold										66
67											67
68											68

COST ALLOCATION - GENERAL SERVICE COSTS	PROVIDER NO:	PERIOD: FROM ______ TO ______	WORKSHEET B PART I (CONT.)

	COST CENTER DESCRIPTIONS	NONPHYSICIAN ANESTHETISTS 19	NURSING SCHOOL 20	INTERNS RESIDENTS SALARY AND FRINGES 21	INTERNS RESIDENTS PROGRAM COSTS 22	PARAMEDICAL EDUCATION (SPECIFY) 23	PARAMEDICAL EDUCATION (SPECIFY) 24	SUBTOTAL 25	POST STEPDOWN ADJUSTMENTS 26	TOTAL 27	
	OUTPATIENT SERVICE COST CENTERS										
69	Home Program Dialysis Equipment--100% Medicare										69
70	Intern-Resident Service (Not Apprvd Tchng Program)										70
71	Administrative and General--HHA										71
72	Skilled Nursing Care--HHA										72
73	Physical Therapy--HHA										73
74	Occupational Therapy--HHA										74
75	Speech Pathology--HHA										75
76	Medical Social Services--HHA										76
77	Home Health Aide--HHA										77
78	DME-Rented--HHA										78
79	DME-Sold--HHA										79
80	Home Delivered Meals--HHA										80
81	Other Home Health Services--HHA										81
82	CORF										82
	SPECIAL PURPOSE COST CENTERS										
83	Kidney Acquisition										83
84	Liver Acquisition										84
84A	Heart Acquisition										84A
85	Other Organ Acquisition										85
89	Skilled Nursing (Respite)--HHA										90
90	Home Health Aide/Homemaker (Respite)--HHA										
91	Ambulatory Surgical Center (Distinct Part)										91
92	Hospice										92
93											93
94											94
95	SUBTOTALS										95
	NONREIMBURSABLE COST CENTERS										
96	Gift, Flower, Coffee Shop & Canteen										96
97	Research										97
98	Physicians' Private Offices										98
99	Nonpaid Workers										99
100											100
101	Cross Foot Adjustments										101
102	Negative Cost Centers										102
103	TOTAL									F263	103

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